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Australian Iron & Steel Foundry Industry

There has just come into our possession a "Brief Review of the Australian Ferrous Foundry Industry," which has been prepared by the Division of Industrial Development of the Department of National Development of the Commonwealth of Australia. It is very detailed and of real interest to home readers. From it, we learn that the first iron foundry in Australia was established in 1833 by Richard Dawson in Little George Street, Sydney. Progress in the industry was slow, and by 1914 the production of iron castings was only 45,000 tons per annum. The first world war period saw production mounting and by its end the rate reached 70,000 tons per annum, mainly because there became available national supplies of pig-iron. A factor not well known is that, in 1940, the chief source of supply of foundry pig-iron was changed from New South Wales to Whyalla, in South Australia. Because of the long sea route to New South Wales, where over 50 per cent. of the consumption of pig-iron is centred, there have been, from time to time, heavy shortages. However, expansion has been continuous and by 1951 there was an output of 300,900 tons of iron castings and 32,100 of steel castings.

There are 446 iron and steel foundries in the Commonwealth, the major proportion of which are to be found in New South Wales and Victoria. The classification used is unique and comprises "steel," "iron and steel," "repetition iron," "jobbing iron," and "jobbing and repetition iron." It is at least a realistic one and probably serves better than most. A very interesting Table is given showing the ratios of steel and iron foundries in Australia, the U.S.A., Canada, and the U.K. This table shows that whilst the first three countries show either 8 or 9 per cent. of steel foundries, in this country there is only 5 per cent. Quite an important section is devoted to the general market situation, wherein Tables are given showing demand, production, and capacity, as well as imports and exports. In 1951, the industry was working at only 57 per cent. of its capacity, yet the delay in delivering the goods was at a minimum, with light (under 56 lb.) iron castings taking 2 to 6 months and for those entering the 10-cwt. to 10-ton range 4 months to 2 years. This condition is confirmed by another Table which shows the demand for both iron and steel castings to be well beyond the productive capacity, let alone actual output.

Table 31 is very interesting, as it shows the quantity and value of the principal materials used by the industry in 1950. It totals £A9,797,000. For core oils no less than £A645,000 was spent. The industry was employing 15,220 people in May, 1952, which showed an increase of about 900 over the previous year. In November, 1952, there were 119 vacancies, practically all of which were for skilled men, and 172 for juniors. There is an interesting section on technology and equipment, but as this is meant for home consumption, it would be invidious of us to detail it. Suffice it to say that many of the recommendations apply in this country, though perhaps not quite so forcibly. We congratulate the authors of this Report on having given to the Australian industry reasonably up-to-date figures of real value.

National Foundry Craft Training Centre

Certificates Presented to Students

Certificates, testifying to their successful completion of the four courses forming the syllabus of the National Foundry Craft Training Centre, were presented at Birmingham to ten students on Thursday of last week. The chairman of the management committee of the Centre, Mr. A. N. Wormleighton (Phosphor Bronze Company, Limited) presided.

In presenting certificates, wallets and their progress reports to the successful students, he emphasized the fact that the craft of the foundryman had existed almost as long as man himself. Although new methods of mechanization tended increasingly to take care of bulk quantity production of castings, there was no foreseeable end to the need for the skill of the foundry craftsman. With every change and improvement that might come from bulk production, there was needed behind it the craftsman's special contribution. He urged the students not to fall into the error of supposing that by the receipt of their certificates and their successful completion of the four courses, they had dispensed with the need for further study. With diligent and continued study, there was no reason why in years to come they should not be worthy to take their places as foundry superintendents and foremen. Mr. Wormleighton also paid a tribute to the high quality of the instruction given at the Centre by Mr. Francis D. Roper, the instructor, and to the care the boys received at their residential club from Mr. and Mrs. Jenkins, the warden and his wife.

The following were the successful students:—Mr. James Barrie (Harland Engineering Company, Limited, Alloa); Mr. Donald Brammer (Garton and King, Limited, Exeter); Mr. Brian Conway (James & Ronald Ritchie, Limited, Middlesbrough); Mr. R. K. Cosway (Exleigh Foundry, Limited, Tiverton); Mr. G. H. R. Davidson (Shanks & Company, Limited, Glasgow); Mr. J. Durrant (James & Ronald Ritchie, Limited); Mr. A. G. Hunt (Exleigh Foundry, Limited); Mr. A. Leech (James Hodgkinson (Salford), Limited); Mr. G. W. C. Potter (Robert Boby, Limited, Bury St. Edmunds); and Mr. G. T. Sibley (John Hobkirk, Sons & Company, Limited, Bedford). In addition, Mr. T. S. Miller (Silley Cox & Company, Limited, Falmouth), who was able to attend the fourth course only, received his wallet and progress report. Mr. G. W. C. Potter moved, and Mr. G. T. Sibley seconded, a cordial vote of thanks to all those who had assisted them and the other recipients in their training at the Centre. They made presentations of attractive table ornaments cast at the Centre to the chairman and to the honorary secretary of the Centre, Mr. R. Forbes Baird. In addition, the successful students presented Mr. Roper with a propelling pencil, and Mr. Jenkins with a cigarette case. Those present included Mr. A. G. Hancock (Exleigh Foundry, Limited); Mr. J. Hird (Rudge Littley, Limited); Mr. G. R. Shotton (Shotten Bros., Limited); and Mr. R. Yeoman (James Hodkinson (Salford), Limited).

A TRADING PROFIT of £54,486 for the year ended June 28 last is announced by Lightalloys, Limited, Willesden, London, N.W.10. Last year's corresponding figure was £91,269. Mr. J. C. Colquhoun, the chairman, says that the lower profit was due to reduced turnover coupled with a downward trend of selling prices, and that it reflects the general recession which the light metal foundry industry has suffered during the past year.

Death of John Travers Hobkirk

THE DEATH IS ANNOUNCED of JOHN TRAVERS HOBKIRK, which took place last Thursday. He was the eldest son of the late Mr. and Mrs. William Turnbull Hobkirk, and was born at Leith 86 years ago. At the age of 8½ years Mr. Hobkirk worked in a factory, but this was before the School Board Act came into operation, and he then had to return to school until he was 14. Apprenticed as a brass moulder for seven years, he was later promoted foreman in a Liverpool factory and subsequently worked at the Barrow-in-Furness shipyards and at G. & J. Weir, Limited, of Cathcart. In 1900 he joined the Bedford engineering firm of W. H. Allen, Sons & Company, Limited, as foreman of the brass foundry and remained with that company for 18 years, reaching the status of foundry superintendent. He was presented to King George V and Queen Mary when they visited Queen's Works, Bedford, on June 27, 1918. With his son, Mr. W. T. Hobkirk (vice-chairman of the South of England Ironfounders' Association), he founded the business now known as J. Hobkirk, Sons & Company, Limited, in Bedford. Very soon, larger premises were necessary, and after one other move the company acquired a site in Ampthill Road, Bedford, where their head office is now located. The last year of Mr. Hobkirk's life saw the further growth of the company by the acquisition of a second factory, now used as a non-ferrous foundry, at Kempston Hardwick. Immensely popular with employees and colleagues, Mr. Hobkirk had over 70 years' active connection with the foundry trade, and until a few weeks ago regularly attended his business every day despite his great age.

Spheroidal-graphite Cast Iron Conference

During the run of the Paris international foundry congress, five hundred technicians, representing 14 nations, attended a conference organized by the Mond Nickel Company, Limited, for their licensees. One of the major subjects discussed was the actual making of castings in spheroid-graphite cast iron, especially the use of the basic cupola. The field has been considerably widened in recent times and now includes the making of rolls, heat-resisting castings, agricultural components, piston heads for Diesel engines, cylinder blocks, and marine-engineering castings, such as propellers, piping and bridge work. This third conference was followed by visits to works in the north and east of France, where this type of iron is currently made.

NEARLY 200 AWARDS—an increase of 50 over last year—were made under the British Insulated Callender's Cables, Limited, further education scheme to employee-students who had successfully taken courses at the BICC day continuation school at Prescot (Lancs) or at local technical colleges. In presenting the awards Mr. Aldridge, a director, stressed the value of education to industry. He said there were always jobs available for those who showed ability and diligence in their studies.

An Amendment.—In a report of Mr. Newman's speech at the dinner of the Joint Iron Council, he was reported to have said "in the elements of costs of pig-iron, gas and electricity was more than one-eighth of the ironfounding industry's total operating costs, or about a quarter of the total cost of materials and fuel." In point of fact, what Mr. Newman said was: "The cost of coal and coke, directly and as an element in the costs of pig-iron, gas and electricity was more than one-eighth," etc.

Designing an Iron Foundry

*By Donald Appleyard and Stephen Rosenberg**

The Architectural Association's School of Architecture conducts a five-year course in the subject. In the fourth year, one of the projects is the design of an industrial building, and last year the subject was an iron foundry to suit the manufacturing programme of Ransomes Sims and Jeffries at Nacton, Ipswich. What follows is an account of how the Authors set about this project and the results of their deliberations. Although this report of the two students' work betrays a certain naivété, it is most interesting to foundrymen as giving a completely unbiassed outlook on day-to-day problems, with a more enthusiastic eye to future possibilities, and hence perhaps a more prophetic attitude than would be achieved by those raised in, and therefore limited to traditional foundry environment.

Programme

The existing works of Ransomes Sims and Jeffries at Nacton, Ipswich, include a mechanized department for the production of light iron castings and a section for ploughshares as well as medium and heavy castings. All the work is carried out in one large shop to which are attached the cupolas house a heavy fettling plant, and a shop for coremaking and storage. There are eight cupolas, four working one day, the other four the next. Most of the moulds are made with hand-squeeze machines in the normal boxes at the side of the pouring bays. Adjoining buildings house patternmaking and pattern storage, and the workers' cloakrooms and amenities.

The students' rôle was to design a functional and economical building whilst still meeting specific local requirements. Every new building must be a clearer realization of the needs and hopes of man, and an industrial building should be genuinely planned to accommodate men and machines. To carry out this job, the Authors studied some methods and conditions in foundries. By kind permission of the management they visited the Nacton Works at Ipswich (the manufacturing programme of which was to be followed) the foundry of the British Bath Company, Limited, at Greenford, that of the Ford Motor Company at Dagenham, and the experimental installation of the Polygram Casting Company, Limited, at Chiswick. They also studied the minutes of the conference on heating and ventilation in foundries, the "Garrett" Report; work on "Dust in foundries" and copies of this JOURNAL.

The first decision made was concerned with the operation of the process itself. It was decided to mechanize the movement of castings, and the mould- and core-making, which becomes possible through the use of the

* The Authors are students at the Architectural Association's School of Architecture.

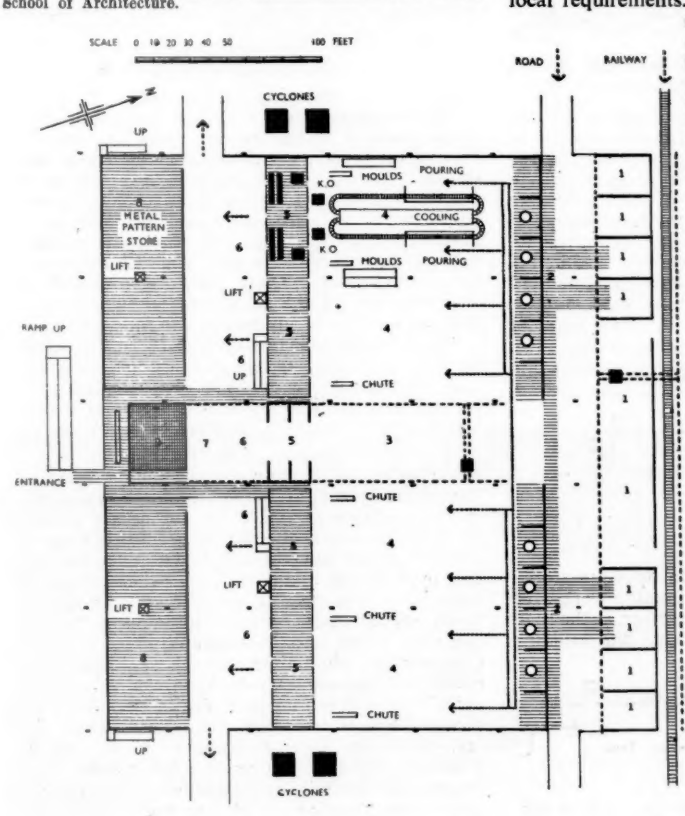

FIG. 1.—*Plan of the Suggested Layout of a Foundry to include Shell Moulding, based on Ransomes, Sims and Jeffries Foundry at Ipswich.*

shell-moulding process. This decision was taken in order to discover what improvement in conditions, efficiency and economy there would be, which would balance the cost of the initial installation, when applied to existing foundries.

PROPOSED SOLUTION

Planning for Products

Raw materials arrive by road or railway at the North end of the foundry. They are stored and lifted by gantry on to a loading bay for feeding into the cupolas which serve five casting bays. The central bay is reserved for heavy castings and has an overhead gantry along its full length, reaching from the cupolas to the dispatch road. The other four bays, for light and medium castings and for ploughshares, are already mechanized.

From the cupolas, the molten metal is taken a short distance by monorail to the prepared moulds which are circulating on a conveyor track.

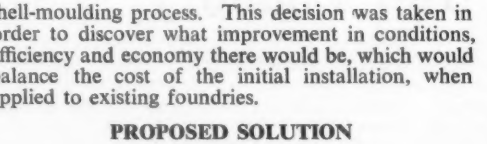

FIG. 2.—*Sectional Sketch of Raw-materials Arrival, Melting and Pouring.*

Introducing the revised layout designed by the Authors, as if it were, in fact, a foundry already in being, reference is here made to the plan of the building (Fig. 1) and a description is given of one of the mechanized bays by means of progressive sketches of the sections (Figs. 2 to 7). After pouring, the castings continue through a cooling tunnel 60-foot long to the knocking-out station and the fettling machines. Both knocking-out and fettling operations are reduced by the use of shell moulds, because of the smaller amount of sand required and the nature and precision of the mould. The fettling area is completely enclosed to confine the noise and dust.

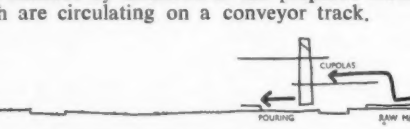

FIG. 3.—*Sectional Flow Diagram, including Cooling, Knocking-out and Fettling.*

Beyond the fettling area, the castings are stored for dispatch by road, mostly to adjoining works, for assembly there. Dispatch is under cover, as the road for this purpose runs right through the building from east to west.

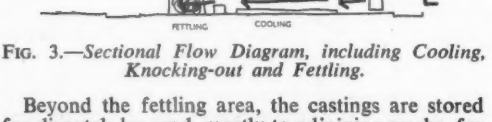

FIG. 4.—*Process Layout to include Despatch to the Machine-shop Adjacent.*

This uninterrupted process, in one straight line from cupolas to dispatch, is made possible by *lifting* the mould-making shop to the first floor and feeding the moulds in, in the direction opposite to the flow of castings.

The wood and metal pattern-shops and stores are situated on the other side of the dispatch road, the shops on the first floor and the stores below. Raw materials for the patterns, a very infrequent service, come in along the dispatch road. A bridge over the dispatch road connects the patternshops to the shell-moulding machines which make the moulds and cores. The machines are set on the roof of the enclosed fettling area, that is, at first-floor level. The small amount of sand and resins required for shell-moulding (10 per cent. of that for box moulds) is raised from the dispatch road to the machines by lift, and the baked cores and moulds are slid down by chute on to the other side, where they are assembled and placed on the conveyor track ready for pouring.

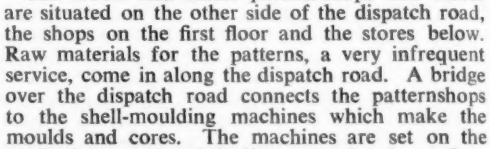

FIG. 5.—*Further Elaboration of Scheme to take in Patternshop and Mould-making on the First Floor.*

Planning for Workers

The workers all enter the building through the centre section of the pattern block, on the south side of the building and cloakrooms are arranged on two floors. Those working on patterns and moulds enter at first-floor level by means of a ramp, clock in and pass through the cloakrooms to their place of work on the first floor. Immediately below, foundry workers enter their cloakrooms on the ground floor. These men are provided with showers, and all the lavatories are less than two minutes walk from any part of the foundry.

The foundry manager's office is on the ground floor between the workers entrance and the casting bays, with a window on to the dispatch road. The canteen and medical block serves several factories and is connected to the Foundry by a covered way.

Structure of the Building

The structure of the projected building was determined entirely by functional requirements and a model is shown in Fig. 8. Columns are placed in lines 66 ft. apart, the width of one casting bay, so that further bays can easily be added on to the east or west side of the building, when extension is necessary. Pre-stressed concrete beams span the 66-ft. bay, at 22-ft. centres, and support the opening roof lights and V-shaped aluminium gutters. Concrete and aluminium were chosen because their plane surfaces are easy to keep clean inside, and aluminium will not corrode, inside or outside. The concrete beams are fitted with rails to which lighting, ducts and light machinery can be attached. The wall cladding consists of a brick dado, a continuous viewing window at eye level and above this aluminium sheeting which can be washed down easily.

Disposal of Dust and Fumes

All fumes and dust are extracted at their source, allowing the general ventilation to be by natural means. Fumes from the pouring and cooling operations are collected under hoods and in the cooling tunnel. They pass along in overhead ducts to join the fumes from knocking-out and fettling. The fettling station is effectively confined by the floor of the moulding machines above it, and all the outgoing ducts are suspended directly below this floor. The fumes from pouring and cooling continue through these ducts where they are joined by the fumes and dust from knocking-out and fettling arriving from directly below. Fumes from the moulding machines situated above, also go into ducts underneath the first floor.

Solid matter from the knocking-out and fettling operation is taken outside the building by underground conveyor.

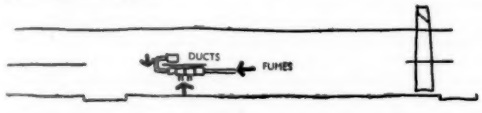

FIG. 6.—*Sectional Location of Localized Fume and Dust Collection and Disposal Plant.*

Roof Construction

When the fumes and dust are dealt with at their source, the function of the roof is clarified:—(1) It must keep out rain; (2) it must enable the foundry to be ventilated in accordance with weather conditions; (3) it must provide even lighting at the working level, without direct sunlight in the pattern- and mould-making areas where work is more precise; and (4) it must be easy to clean.

The Authors have evolved a roof construction from Hill's (West Bromwich) power-operated ventilating shutters, which have already been used with success in a number of foundries. The corrugated iron is replaced by transparent plastic sheets, so that the roof is always completely open to light and can be opened to the sky in warm weather. The structure of concrete beams, each 6 ft. deep, and the aluminium gutters running in the opposite direction, cut out and diffuse the direct lighting and

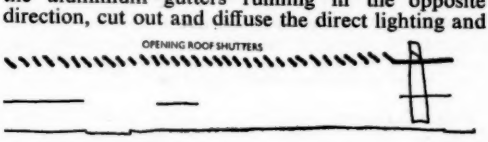

FIG. 7.—*Schematic Representation of Roof Opening Shutters for General Ventilation.*

reduce glare from the roof. When the shutters are open, the plastic sheets can be cleaned from catwalks on the roof.

This type of roof extends over the whole foundry, except near the cupolas, which means that everywhere except in that spot the lighting and ventilation can be adjusted. The roof is 30 ft. above the floor, for good ventilation, and can therefore accommodate the two floor heights which occur at the cupolas, the fettling stations and the pattern stores.

Conclusion

The floor area of the building has been greatly reduced from that of the existing foundry, the production output being unchanged.

The comparative floor areas are:—

—	Existing works at Nacton.	New project.
Total casting area (pouring, cooling, sand-preparation, mould- and core-making and fettling), approx ..	90,000 sq. ft.	60,000 sq. ft.
Total foundry area (total area of all floors), approx.	120,000 sq. ft.	100,000 sq. ft.

By planning the building under one roof, there has been some saving in area and large savings in external walls, roads, and ducting. By using shell moulds, storage space for raw materials is reduced, a sand reclamation system and moulding boxes are unnecessary, and the knocking-out and fettling stations are smaller and simpler. Improved efficiency, better working conditions and easier maintenance are other gains impossible to assess accurately unless the foundry is seen at work. The Authors wish to thank the Editor of the JOURNAL for his interest in their project, and for the advice and help.

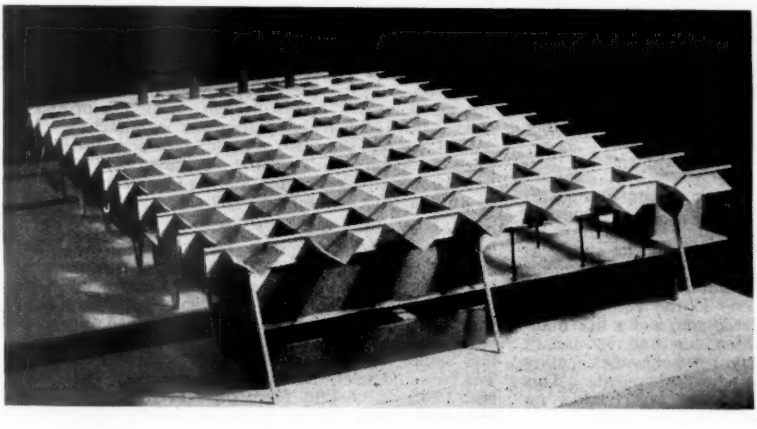

FIG. 8.—*Model of the Foundry constructed to conform to the Authors' Designs, showing the Roof Construction adopted.*

New Catalogues

Stellite. A leaflet received from Doloro Stellite, Limited, Highland Road, Shirley, Birmingham, describes and illustrates some interesting uses of this alloy under strenuous service conditions.

Portable Electric Tools. Wolf Electric Tools, Limited, of Hanger Lane, London, W.5, in a brochure carrying the title "The Electric Tool User" have dealt very interestingly with the whole field of portable tools, and have included a two-page article on a new 6-in. high-speed heavy-duty grinder such as is used in foundry fettling shops. The pamphlet, taking the form of a magazine, is available to our readers who write to Hanger Lane.

High-Alumina Bricks. A catalogue full of sound data on this class of refractories has just been issued by John G. Stein & Company, Limited, of Bonnybridge, Scotland. There was a time when the users of firebricks possessed more scientific data than the makers, but today the refractory manufacturer provides customers with such details of physical properties that it is now necessary to correlate them with ultimate use. The pictures included, taken after use, are still valuable to the user, as there are always unknown operative factors such as furnace atmospheres and their impurities. This catalogue can be obtained from the Company at Bonnybridge.

Ladle Additions. The British Electro Metallurgical Company, Limited, of Wincobank, Sheffield, in their new brochure No. 152 include much interesting data as to the effect of ladle additions of S M Z alloy to cast iron. Figures are given showing the results of its use on chill, transverse deflection, tensile and Brinnel hardness for 1.8 per cent. Si iron; up to 2.2 per cent. Si; for 1.5 and 2.0 per cent. chromium irons and other compositions. Being essentially technical in character, the brochure makes a worthwhile addition to a trade-literature library. It is available to readers on writing to Wincobank.

Corebox vents. An added service is being given to the foundry industry by Temple Instruments Limited, of Sharrocks Street, Wolverhampton, through the provision of corebox vents made from steel instead of the conventional brass or die-cast material. A leaflet received from this firm details a full range of sizes with slots 0·070 in. wide in both deep and shallow heads, as a stock line. With the leaflet is a price list. It seems that no special tools are needed for fitting these precision corebox vents as they have their edges milled to close tolerances to fit a drilled hole and they are interchangeable. The leaflet is available on writing to the Wolverhampton address quoted.

Beryllium. The Beryllium Smelting Company, 36-38, Southampton Street, London, W.C.2, have issued a 16-page catalogue which loses nothing of interest by being American in origin. Beryllium and its alloys, as is obvious from this brochure, have made enormous strides during the last two decades. For instance, it finds seven distinct applications in the equipment of the Lockhead Constellation aeroplane, and a like number in both a modern motor car and a modern American kitchen. There is shown a die in this alloy for pressure die-casting a camera component. This interesting brochure is available to our readers on writing to Southampton Street.

Wage-Fixing on a Revised Basis

The present out-of-date method of negotiating wages within individual industries had a curious parallel in the system by which nations claimed absolute sovereignty and thus brought about wars, said Lord Beveridge in an address on "Ten Years After the Beveridge Report" to the Community Council of Lancashire in Manchester at the end of last month. Though the Report's main principle—that benefits should be sufficient for subsistence and paid as of right because of contributions made—had been accepted, the National Insurance Fund was going to show a large deficit in the future, and the speaker suggested that the problem of providing for old people was going to be a desperately difficult one for the Chancellor of the Exchequer in the next 25 years. The pound had fallen in value, and pensions were becoming inadequate; the cause of the present trouble was the spiral of wages, costs, and prices.

Every time a group of employers and a group of working people agreed to raise the wages to be paid for the same product, they were doing something to diminish the value of money and to make life harder for people living on pensions or on savings from the past. Lord Beveridge saw the remedy, not in unemployment, but in some sort of national machinery for determining wages. The days of independent bargaining had passed.

Government's Part in Exports

A firm line from the Government in aiding entry to oversea markets was called for by Sir Harry Pilkington, president of the Federation of British Industries, at the introductory session of the federation's export sales conference, held recently in Buxton. The greatest need was for markets, but in the last 50 years market after market had been closed to this country by restrictions such as tariffs, quotas, embargoes, and licensing and payments difficulties. Barriers erected by other governments, declared Sir Harry, could only be pulled down by our own Government, and progress to that end was still too slow.

Nickel Restrictions Removed

All restrictions on the end use of nickel have been removed by the Board of Trade and the Ministry of Supply. The Minister of Supply has withdrawn the alloy steel directions restricting the use of nickel in the manufacture of alloy steels.

O.E.E.C. Lifts Nickel Ban

The organization for European Economic Co-operation on October 31 lifted the ban on the use of nickel, nickel alloys, and nickel plating for manufacture. Improved nickel supplies allowed the organization to release member countries from a common decision taken in May last year restricting the use of nickel, according to an O.E.E.C. spokesman.

THE MINISTER OF SUPPLY (Mr. Duncan Sandys) has decided, after consulting the Iron and Steel Board, that it is no longer necessary to control the maximum prices of vertically cast and spun pipes and special iron castings, cast iron drain pipes and fittings, forged alloy, gun billets, railway tyres, wheels and axles, and other forgings, under Defence (General) Regulations. The Order, The Iron and Steel Prices (No. 6) Order, 1953 (S.I. 1953, No. 1590), came into force on November 9, and is obtainable from Her Majesty's Stationery Office.

Feeding of Steel Castings at Greater-than-atmospheric Pressures*

Discussion of the Paper by C. W. Briggs and H. F. Taylor

In the unavoidable absence of the American Authors, this Paper, when presented at the Institute's Blackpool Conference, was introduced by MR. J. F. B. JACKSON, with DR. C. J. DADSWELL, past-president, in the Chair. (Mr. Jackson is director of the British Steel Castings Research Association.)

After the reading by Mr. Jackson of a brief *résumé* of the Paper and of the events which led up to the researches which were reported, the CHAIRMAN asked if anyone had had experience of increased pressure casting.

A MEMBER pointed out that in the investment casting process increased pressure was used and die-castings were also pressure cast. One effect of the pressure was to ensure very fine detail was reproduced in the casting from the mould. It was also believed, generally, that increased pressure on the downgates gave better feeding of the casting.

MR. JACKSON pointed out that in "pressure casting processes" such as pressure die-casting, pressure was applied mainly to ensure that metal filled the mould cavity and that the mould surface and contour was reproduced in the fullest possible detail. As to the possibility of increased pressure in such processes giving better feeding, he could only comment that over and above a minimum pressure requirement such a belief was in direct contradiction to the findings of the Authors of the Paper under discussion.

Optimum Feeding Pressure

MR. A. R. PARKES said it seemed surprising to him, from a spectator's point of view, that though it was generally admitted that atmospheric feeding worked well—at about 13 to 15 lb. per sq. in. pressure—and was a sound principle to apply to feeding practice generally, yet, according to the Paper, pressures above atmospheric did not work so well and did not effect any improvement. Where was the dividing line between beneficial effects and where no further improvement was found?

A further point was that there was no mention that he had seen in the Paper of the temperature increment above the metal liquidus at which the experiments were conducted. Surely, that would affect the time available for feeding to take place.

MR. JACKSON replied that although an atmospheric side head used on a large casting could undoubtedly prove advantageous, he was of the impression that the dimensions of the castings described in the Paper were too small for them to benefit from this feeding arrangement. As long as there was sufficient pressure in the atmospheric head to feed the steel into the mould cavity while it was solidifying, the Authors had found that there was no advantage to be gained by increasing the pressure beyond this minimum requirement. Their work, however, had not included reference to the influence of feeding pressure on the physical or mechanical properties of the steel, the assessment having been carried out in terms of casting soundness.

MR. E. LONGDEN asked if it would be logical to say that any increased pressure would result in improved casting density and soundness if the mould would hold it.

MR. JACKSON replied that, as he understood the Paper, that was not so.

A MEMBER said he could remember moulders putting damp asbestos on the top of the riser system and putting a weight on top of that so as to generate steam pressure for feeding. In every dental laboratory when casting gold, that was always done to get pressure after pouring the gold so as to get the metal driven into the fine detail of the mould.

ANOTHER speaker pointed out that in the past many moulders had used wet riser boxes and covered them with bricks after pouring for the same purpose.

THE CHAIRMAN said he did not agree entirely with Mr. Jackson and had some sympathy with Mr. Parkes' question; what was the limit at which an atmospheric riser, which was really a pressure riser worked? To his way of thinking the atmospheric riser was pushing the steel into the vacuum which was created in the mould as the steel solidified. Mr. Parkes did not know why if 15 lb. per sq. in. pressure worked, 16, 17 or some other higher pressure did not work better.

MR. JACKSON said that while the work described in the Paper had shown that nothing was to be achieved by increasing feeding pressures beyond atmospheric, the Authors had not attempted to indicate the precise value of the critical feeding pressure in any particular instance.

Practicability the Real Criterion

Mr. J. G. BAILES thought Mr. Parkes had missed the operative word, which was whether the job could be done "satisfactorily." One of the first castings he had seen to which pressure had been applied almost blew the whole of the steel through the roof!

To obtain the required gas volume to equal the volume of shrinkage would be a difficult calculation and gas evolution would have to proceed at the same rate as solidification in order not to exert too much pressure. The steelfounder was always looking for new ways of improving feeding and one of the ways often tried was to raise pressure, but he

* Paper printed in the JOURNAL, October 1 and 8, 1953.

had seen "heads" blown off and he had seen a casting distorted to such a shape it was impossible to recognize the pattern.

THE CHAIRMAN, supporting this view, said he thought members should read the Paper again—the Authors were not sure whether it was possible to find practical application of pressure and if one could do it, they were not sure whether it would be worth while. If one was making one type of steel casting continuously one might devise a feeding capsule that would work, but perhaps there were other things which varied and which, although one had a perfect capsule, would cause it to fail.

MR. JACKSON said that the overriding requirement in all circumstances was that there should be satisfactory directional solidification and an uninterrupted thermal gradient towards the feeder head. If this requirement was not satisfactorily met, no increase of pressure or feeding capsule would correct matters and achieve internal soundness. The Authors had shown that capsules could be produced which would function without causing metal penetration of the mould face, but that in the instances where these were employed they made no claim that there had been advantage given in respect of casting soundness.

A Problem on its Own

MR. BAILES emphasized that the work on that had been carried out on steel. At the meeting iron-founders were asking questions, but it should clearly be understood that the Paper referred only to steel. There was no doubt that there was need for a certain amount of pressure in iron founding; that had been proved.

Another thing which had been proved was that that method of trying to supply pressure for feeding was not successful, as it could not be controlled efficiently. He understood that some success had been obtained in checking solidification in moulds by pressure methods, was there any information available to the meeting on that aspect?

MR. JACKSON said that the research by Briggs and Taylor had put the pressure capsule "out of Court" as a practical foundry proposition, and that they went further to show that even where the magnitude and rate of application of gas pressure could be strictly controlled, no improvement in casting soundness was to be expected over and above that obtained under atmospheric pressure and with correct and satisfactory freezing gradients.

A MEMBER recalled, in connection with increased pressure giving increased density, a report of a case where two castings were made under identical conditions except that one was poured faster than the other. The fast-poured casting was much heavier. That seemed to indicate that increased pressure did give increased density.

MR. JACKSON thought that this might be rather jumping to conclusions. Possibly, increased pouring rate would in certain cases give a denser casting, but in this instance factors other than increased pressure of feed would be operative.

Reverting to Mr. Longden's question, it should be emphasized that Briggs and Taylor had based their assessment of the effect of feeding pressure on radiographic examination of the test castings. It was always possible that if the work were to be extended to include an assessment based upon the mechanical properties of the metal, then some advantage might be shown for feeding at pressures in excess of atmospheric. He thought that Mr. Longden had at the back of his mind the fact that in steelfounding, for many years past, it had been traditional to use riser heads of considerable height. It might be that this was basically sound, but there was little experimental data to support this. The present tendency was in fact to reduce the height of feeder heads. The whole subject of feeder-head geometry was, however, at present on an empirical basis, and constituted a problem which was being investigated by the British Steel Castings Research Association.

Present-day Ideas

MR. DAYBELL, in response to a request from the chairman for some comments on the matter (since he was a member of the firm where the initial experiments on pressure feeding were reported), said his firm could not find a practical method of applying pressure which was economical. At the present time, they felt they could get just as good results from atmospheric pressure feeding as they could by trying to find some more complicated and costly means of producing sound steel castings. For that reason, at their present state of knowledge, they agreed with the Authors of the Paper under discussion.

On the question raised by Mr. Parkes as to where the pressure dividing line might come, a MEMBER asked, was it possible that one only needed a very small differential pressure to feed a fluid metal into a casting.

MR. JACKSON said he thought the point was perfectly sound, and one with which he could not personally disagree. When answering Mr. Parkes, he had been talking in terms of a large casting having a side atmospheric head, and in which the liquid metal might have to be raised some two or three feet above the height of the head. A relatively large positive pressure would then obviously be necessary in order to feed the liquid metal against the force exerted by gravity.

The CHAIRMAN (Dr. Dadswell), closing the meeting, said how glad he was that Mr. Jackson had acted on behalf of the Authors. He was sure Mr. Jackson was gratified that there had been such a good discussion because Mr. Briggs had written to say the Americans had been very interested in the original conception of greater-than-atmosphere feeding which they agreed was an ingenious one, and was developed in one of the steel foundries of this country. It had created so much interest that the very powerful research organization conducted by Mr. Briggs—the Steel Founders' Society of America—thought it worth while following it up. They had done that with great thoroughness, as members had heard.

WRITTEN COMMENT

MR. S. T. JAZWINSKI wrote that the Authors were to be congratulated for their rather extensive study of higher pressures than atmospheric applied to static moulds.

Since, basically, their efforts were to further work done by himself in Britain, it seemed logical that the writer should make some observation based on original ideas and foundry experience in this respect. Theoretically, any casting from pouring to room temperature is subject to volume changes. Contraction of a casting below solidification point is adjusted by pattern design. Liquid shrinkage and shrinkage on solidification are compensated by feed metal supplied by risers. Hydrostatic or even atmospheric pressures are in many cases satisfactory for production of sound castings.

Requirements for Success

In comparing foundry with other technologies, it seems obvious that the risering is a crude method and expensive one. The ideas of higher pressures than atmospheric applied to static moulds is equivalent to lifting foundry technology from the Middle Ages to the Atomic Age and, of course, is difficult to digest by conservative minds. Properly-applied high pressure is inexpensive and economical. Two main factors must be considered for success:—(1) Delayed action, which means that sufficient thick skin is formed preventing any sand erosion or swelling of a casting; (2) when strong skin is formed and actually shrinkage starts to take place, hot metal is pumped in to compensate for shrinkage. This condition does require a reservoir of hot metal under high pressure. It is necessary that the metal supplied is in position to dissolve dendrites formed or to interlock with them to produce a dense mass.

In the evaluation of the proper condition for timing the starting point, by using a control condition with inert gas, the authors selected right method. Unfortunately, the data produced are very limited and do not give the answer to the question of when the pressure should be introduced. In effect the writer is inclined to think that due to swelling encountered and sand erosion, liquid metal for shrinkage compensation was used too early. This approach resulted in the false conclusion that rather low pressures are satisfactory.

On page 2 of the preprint the authors made the statement that selection of capsules would be critical on account of the need to bring about (1) exact delaying of the action (*a*) to build sufficient skin strength (*b*) to accommodate wide variations in feed demand, and (2) development of a low pressure, early on, and an increasingly higher pressure with time. It may be added that in personal experiments, the control of time was successful and was done by using various thicknesses of refractory capsules and low-heat-conductivity coatings for preventing the early formation of gas in the capsule itself.

On page 5 of the preprint, the authors describe the difficulties when applying high pressure caused by metal flowing out of the downgate and over the side of the mould. The remedy for such effect may be found in the writer's paper*.

In summarization, the paper is a valuable addition to a new technological method in foundry technique, in spite of the fact that pressures being applied too early resulted in non-co-ordinated conclusions.

Authors' Reply

MR. C. W. BRIGGS and MR. HOWARD F. TAYLOR wrote in reply that Mr. Jazwinski maintained in his discussion that two factors were necessary if the use of pressures higher than atmospheric were to be successful in feeding steel castings: (1) the formation of a thick skin to prevent sand erosion of casting swelling, and (2) a reservoir of hot metal under high pressures. It would be observed by the studies of Pellini and associates that for certain section designs and steel compositions, solidification in the centre of the section began before a skin of any pronounced thickness was formed. Also, final solidification of a section many take place rapidly once skin formation was well started. This meant that in many cases it was almost impossible to develop a thick skin in a casting to prevent metal penetration and swelling. Also, the solidification pattern in most commercial castings would not be sufficiently known so as to permit the successful application of high pressure during the fast formation of the end-of-freeze thermal-gradient along the centre-plane of the section.

Some control of time of pressure release by the use of gas-forming capsules coated with refractories could be effected as indicated by Mr. Jazwinski, but the close control as required by the solidification characteristics of the section could not be obtained practically nor on a limited experimental basis. Furthermore, in some sections a demand for pressure feeding would come as much as 20 to 30 min. after pouring the casting, if pressure feeding were to be effective at all. It was certain that the coated capsules referred to by Mr. Jazwinski could not remain ineffective so long, nor could they be so devised as to release gas pressures after such long intervals.

It should be pointed out that in personal studies on certain of the sections, gas pressures were applied late as well as early in the solidification cycle of the plate or structure. If they were applied early, there was metal penetration of swelling. If they were applied late, there was little or no difference between the appearance and pressure of the shrinkage cavities in castings with or without the application of pressure. Again, it must be said that the amount and time of application of gas pressure was too critical to accommodate the use of a pressure capsule to any practical advantage.

[Through no fault of the Authors, their answers to other questions posed in discussion have been delayed. However, it is hoped to print their comments on the discussion in due course.—EDITOR.]

* Presented at the Sixteenth Annual Foundry Practice Conference, American Foundrymen's Association, Birmingham District Chapter, in Birmingham, Ala., February 12 to 14, 1948. ("Feeding Castings, a New Approach," by S. T. Jazwinski.)

Dual Lighting in a Brass Foundry

Equipment at Hayward-Tyler & Company, Limited

In choosing light sources for an industrial establishment, consideration must be given to the colour of the materials handled on the premises. This was one of the factors which led to dual lighting from combined tungsten and mercury units being adopted recently at the Luton brass foundry of Hayward-Tyler & Company, Limited, makers of marine and industrial pumps of all kinds. Here it has been found that the low contrast between the colour of the lighting and of the brass enables a high level of illumination to be provided without glare from the surface of the metal.

The lighting scheme was designed by the General Electric Company, Limited, to give an average intensity on the sand floor of 60 lumens per sq. ft. It comprises 24 dual units suspended in four rows of six at 22 ft. above the floor and with a spacing of 15 ft. between fittings and between rows. The foundry has high bays, and it was necessary to support the fittings from catenary wires stretched between the tie beams of the roof. Conduit is also clipped to the catenary between the fittings.

Fittings

Each fitting contains one 1,000-w. tungsten lamp and one 400-w. mercury lamp. No capacitor is required, as the tungsten lamp serves to correct the power factor, which with this lamp combination is approximately 0.91. The choke for the mercury lamp is accommodated in the fitting. The square-type reflectors are specially designed so that the polar curves from the two light sources are generally similar in shape, and a good colour mix is thereby obtained. Total light output from each fitting is 32,200 lumens, of which the tungsten lamp contributes 17,800 and the mercury lamp 14,400. The particular fitting is constructed on the through-draught principle, with large top and side openings to permit the passage of air. These features minimize dirt collection on the fitting. Tests carried out by the G.E.C. research laboratories in surroundings where fittings are exposed to a dirty atmosphere have shown that at the end of five months a through-draught fitting gave 2.4 times the light output of a closed-top vitreous-enamelled type and 1.33 times that of a fitting comprising a vitreous-enamelled reflector and ventilated canopy. The contractor for the Hayward-Tyler installation was H. F. Scriven, of Luton.

FIG. 2.—*Furnaces and Ladles at the same Foundry, showing the uniform illumination and freedom from shadow achieved by the New Lighting.*

FIG. 1.—*Through-draught Form of Lighting Fixture Construction in an Installation of G.E.C. Dual Lighting at the Luton Brass Foundry of Hayward-Tyler & Company, Limited.*

FIG. 3.—*Preparation of Moulds at Hayward-Tyler's, where the Lighting Installation provides an Average Intensity at Floor Level of 60 lumens per sq. ft.*

THE INSTITUTE OF AUSTRALIAN FOUNDRYMEN (Victorian Division) is now firmly established as the Institute of British Foundrymen, Australian branch (Victoria), with Mr. Ebeling as president and Mr. G. D. Thompson as honorary secretary. Mr. Thompson, who has recently been awarded Her Majesty's Coronation Medal, is head of the foundry and patternmaking school at Melbourne Technical College and has carried out an immense amount of work in the development of foundry and patternshop technique.

Influence of Section Size on the Strength Properties of Non-ferrous Sand Castings*

By W. J. Reichenecker

The information presented should not discourage an engineer from using alloys showing the greatest susceptibility to loss in mechanical properties in heavy sections, but should provide additional aid in selecting an alloy for a particular casting. On the other hand, reference to the data given may help in improving casting design for application of a specific alloy.

One of the many factors that influence the mechanical properties of sand-cast alloys is the effect of section thickness upon strength and ductility. In general, as the cast section thickness increases, the unit mechanical properties decrease. Normally, the mechanical properties obtained on ½-in. dia. tensile test-bars serve as a basis for the selection or the application of the material. It does not always follow, however, that the casting will have properties equivalent to those of the test-bar and this is particularly true of castings of a thickness greater than ½ in. Not all alloys show the same degree of susceptibility to loss in mechanical properties with increased section thickness and, therefore, there is no single rule which the designer or engineer can apply in all cases.

The need for information concerning the susceptibility of some of the commonly used non-ferrous casting alloys to loss of mechanical strength with increasing section thickness prompted a study of this phenomenon.

As with any test, the selection of the type of specimen is important and must be considered carefully if the results are to be valid. For this work, a specimen having various section thicknesses, but not excessively complex in design was used (see Fig. 1).

In addition to section size variations, there are other factors such as pouring temperature, gating and risering techniques, casting geometry, melting practice, etc., that exert an influence upon the mechanical properties of the casting. No single test procedure can encompass the full range of techniques necessary to the production of a wide variety of casting alloys or casting designs. Therefore, the gating and risering technique used in making the step bar casting was selected as being representative of commercial practice and is not necessarily the best technique for all the various alloys examined. Pouring temperatures were selected for each alloy within a range normally used commercially for the particular material being cast. All samples were cast in conventional green-sand moulds.

The mechanical properties were determined on tensile specimens machined from the different sections of the step-bar casting, and the results are shown graphically in Fig. 2. Minimum mechanical properties, alloy designation, and nominal chemical composition of the alloys examined are given in Table I.

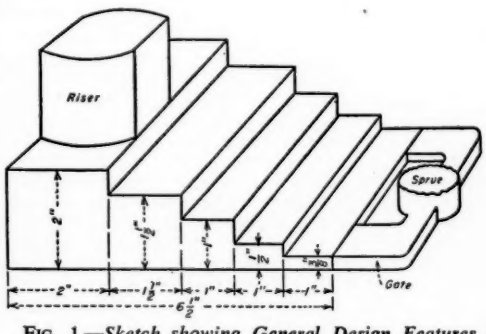

FIG. 1.—*Sketch showing General Design Features of the Step-bar Test Casting used to determine the Data Recorded.*

* Reprinted from *Materials & Methods*. The Author is attached to the Materials Div., Westinghouse Electric Corp., U.S.A.

TABLE I.—*Composition and Minimum Mechanical Properties of Test-bars Selected for Examination*

—	Aluminium alloy.	Tin-bronze 88/8/4.	Red brass.	Tin-bronze 85/5/5/5.	Manganese-bronze.	Aluminium-bronze.	Silicon-bronze.
Alloy designation	A_1	B	C	D	E	F	G
Similar A.S.T.M. specification	B26-48T SC51A	B143-49T 2B	— —	B145-49 4A	B147-49 8A	B148-49 9A	B198-49 12A
Nominal chemical composition, per cent.	Cu — 1.25 Si — 5.00 Mg — 0.50 Al —93.25	Cu —88.0 Sn — 8.0 Zn — 4.0	Cu —87.0 Sn — 3.0 Pb — 2.5 Zn — 7.0	Cu —85.0 Sn — 5.0 Pb — 5.0 Zn — 5.0	Cu —59.00 Mn— 0.80 Fe — 1.25 Al — 0.80 Zn — Bal.	Cu —88.5 Al — 9.0 Fe — 2.5	Cu —93.7 Si — 4.5 Fe — 1.8
Min. mechanical properties[a]: Tensile strength (tons per sq. in.)	14.4	15.6	12.0	13.4	26.8	29.0	20.0
Yield strength (tons per sq. in.)	8.9	8.0	5.4	6.3	9.8	11.2	8.9
Elong. on 2 in., per cent.	2.0	20	20	20	25	20	13

Alloy " A " was tested in the solution treated and aged condition.

[a] ½ in. dia. Sand-cast test-bars.

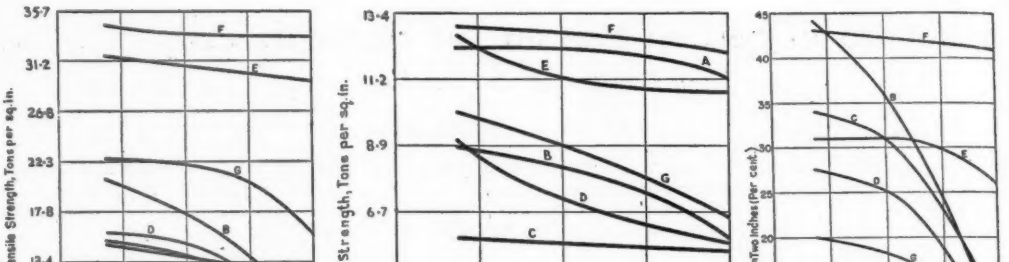

FIG. 2.—*Curves showing the Effect of Section Thickness on Tensile, Yield Strength and Elongation for a Variety of Cast Non-ferrous Alloys (see Table I).*

Effect of Thickness

All the alloys examined showed a decrease in mechanical properties as section thickness increases. The manganese- and aluminium-bronze alloys (E and F) appear to be least affected by variations in section thickness, whereas the tin-bronze alloys are affected to a much greater extent. Heat-treated aluminium-alloy (A) does not show too great susceptibility to the section size effect and the silicon-bronze alloy is relatively unaffected in sections below about 1 to ¼ in. thick.

It should be emphasized that the values shown in the charts should not be construed as typical of these alloys for the section thickness indicated under all circumstances. There are many other factors, previously mentioned, that also have an influence on the properties obtained in a casting of a given alloy. Furthermore, there are techniques available to the foundryman that will partially offset this natural tendency toward lower properties in heavier sections. Such practices as the use of chills adjacent to heavy cast sections, exothermic riser compounds, insulating riser sleeves, and relocation and re-design of gates and risers are all effective in reducing the detrimental effects of heavier sections when associated with poor feeding.

Effect on Design

At Westinghouse, the information on the influence of section size upon mechanical properties was furnished the designer, not to discourage the use of alloys showing the greatest susceptibility to loss of mechanical properties in heavy sections, but to provide additional aid in selecting an alloy for a particular design. Conversely, this information also provides for better design for the application of a particular alloy. For example, increasing the section thickness from 1 to 2 in. for a tin-bronze alloy, such as alloy B, does not necessarily double the load-carrying capacity of the section. Reference to curve B in the tensile-strength chart shows that the tensile strength decreases from about 18 tons per sq. in. in a 1-in. section to 9 tons per sq. in. in a 2-in. section. Therefore, in designing for an alloy of this type, careful consideration should be given to relative section thicknesses and their influence on unit mechanical operations.

Reduction of cast wall thickness is not necessarily accompanied by a proportional loss of mechanical properties. Castings intended for pressure tightness can, therefore, be designed with minimum wall sections consistent with mechanical requirements and in addition derive improved pressure tightness because of the reduced wall thickness.

In the case of an aluminium-bronze alloy, alloy F, the mechanical properties are relatively unaffected by increased section thickness up to about 2 in., and thus an increase in section thickness will be accompanied by an overall gain in load-carrying capacity.

HENRY WIGGIN & COMPANY, LIMITED, have issued a supplementary leaflet to their data book "The Nimonic Alloys," containing additional and amended tables. Torsion properties of Nimonic 80A and Nimonic 90 have now been determined over the range 20 to 1,000 deg. C. and more complete fatigue figures are now available. Copies are available from the company at Wiggin Street, Birmingham, 16.

A DINNER for members of the British Steel Founders' Association and their guests will take place at Claridges Hotel, London, on Wednesday, December 2, preceded by a Reception at which the chairman (Mr. T. H. Summerson) and the vice-chairman (Mr. F. N. Lloyd) will receive guests. Principal guests will include Admiral of the Fleet, Lord Fraser, G.C.B., K.B.E., and the Rt. Hon. W. E. Elliot, C.H., M.C., D.SC., M.P.

Correspondence

MASTER PATTERNMAKERS' ASSOCIATION

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—At a meeting of the Coventry and District Master Patternmakers' Association held on November 11, members discussed the suggestion made in the FOUNDRY TRADE JOURNAL to endeavour to form a national association of master patternmakers which was very favourably commented upon, and I am directed to inform you that their members will give it fullest support. My local Association was formed in March, 1942, and much useful work has been done. Moreover, it has been our privilege to meet the Birmingham, Wolverhampton and Stafford Association on several occasions for an exchange of ideas.

I assume that the objects and functions of the national association would be to bring into closer contact those local associations which now act independently and with limited powers. The characteristics of one united body must be familiar to all master patternmakers as it would undoubtedly possess great powers of negotiation and would have a general supervision over its members. Its constitutional status would command recognition at the "top level" and all master patternmakers would be united for a common purpose.

I hope you will, Sir, prosecute this idea of central authority to its fullest extent, and when the time is ripe to go ahead with the project, representatives from Coventry will be pleased to attend a meeting for the purpose of creating this *national association*.—Yours, etc.,

A. WHITEHOUSE,
Secretary.

Coventry & District Master Patternmakers' Association,
Harper Road,
Coventry.
November 11, 1953.

Shipbuilding Employers' Officers

Mr. T. Eustace Smith, managing director of Smith's Dock Company, Limited, has been elected president of the Shipbuilding Employers' Federation for the coming year. He succeeds Mr. J. G. Stephen, a director of Alexander Stephen & Sons, Limited. Mr. C. A. Winn, joint managing director of C. H. Bailey, Limited, becomes senior vice-president. Mr. H. Willson, chairman and managing director of Wm. Hamilton & Company, Limited, and Mr. J. Hunter, a director of Swan Hunter & Wigham Richardson, Limited, were also appointed vice-presidents.

Mr. R. C. Thompson, chairman and joint managing director of Joseph L. Thompson & Sons, Limited, has been elected chairman of the conference and works board of the Federation. Mr. H. Robb, chairman and managing director of Henry Robb, Limited, has been appointed vice-chairman of the Board.

THE LARGEST Diesel hydraulic locomotive which has so far been built in the Glasgow works of the North British Locomotive Company, Limited, successfully passed a number of trials on November 10. On a stretch of railway track known as the old Coatbridge, Airdrie, and Slammannan line, the locomotive carried out weight-pulling tests. This track was chosen because the gradient, at places one in 23, is perhaps the steepest in the country.

Publications Received

British Steel Founders' Association. Publication No. 5. Issued from Broomgrove Lodge, Broomgrove Road, Sheffield, 10.

This four-page leaflet is characterized by neatness and good balance. In it there are illustrated nine castings demanding something special either as to composition, yield, outstanding properties, or high-grade manufacturing technique to give the requisite results. Such a publication should whet the appetite of engineers for a fuller use of the potentialities of steel castings.

A recent issue of **Tin and its Uses, No. 29,** issued by the Tin Research Institute, Fraser Road, Perivale, Middlesex, contains a well-illustrated article on the work of the Corrosion Laboratories at the Tin Research Institute and explains how test methods are devised to simulate practical conditions. Tin/zinc alloy electroplate, a novelty ten years ago, is now a well established protection for steel surfaces, especially in radio and aircraft equipment for the fighting services.

Nimonic Alloys in Aircraft Production, issued by Henry Wiggin & Company, Limited, Thames House, Millbank, London, S.W.1.

This brochure outlines the story of the development and production of the well-known Nimonic alloys. A gas-flow diagram of the Rolls-Royce Derwent 5 Turbo-jet is shown as typical of the application of these high-temperature alloys for such components as combustion chamber linings, stator and rotor blades. The properties of the Nimonic alloys are summarized and a brief indication given of the uses of the various grades. Copies of this publication are available on writing to Wiggin Street, Birmingham.

Journal of Research and Development, vol. 5, October, 1953. Issued by the British Cast Iron Research Association, Alvechurch, Birmingham.

This issue prints five reports, the first of which revives the old question of the explanation of anomalies in cast iron by the noxious influence of gases. It has been prepared by Mr. B. B. Bach and covers work done by the Association. Of the three gases—hydrogen, oxygen and nitrogen—the first is the most difficult to handle, because there is a continuous evolution right from the initiation of pouring. Even if the sample be suitably quenched and a high figure is returned, it is not a valuable result, as it does not bear a relationship to the hydrogen finally retained. This subject is in a way continued in the second report, prepared by Mr. W. J. Williams, which deals with oxidized iron. Using a high-frequency furnace, and treating the iron with Fe_2O_3, the oxygen content was materially increased, but without effect on the chilling characteristics. A further contribution to this subject is in a third report, again by Mr. Bach, covering the subject of gas analyses of cast iron produced at various foundries. At this stage, rightly, the conclusions deduced relate strictly to what has been found and more has to be done before generally applicable data can be reached.

The fourth report is of a somewhat exotic character. It is "The Influence of Surface Rolling on the Fatigue Strength of Cast Iron," prepared by Mr. G. N. J. Gilbert and Mr. K. B. Palmer. Their interesting experiments did show a significant increase in life obtained at stresses above the fatigue limit. The final report, by Mr. E. R. Evans, on "Temperature Cycles of Enamelled Castings during the Process of Enamel Fusing," shows that better results are obtained in continuous furnaces than in box-type muffles.

Parliamentary

U.K. Uranium Deposits

Although pockets of uranium occurred in Cornwall, the quantities so far found would not justify the expense of mining and treatment, said the MINISTER OF SUPPLY (Mr. Duncan Sandys) in reply to a question from MR. NABARRO. The Minister said that the Government's decision to rely on uranium deposits oversea was, therefore, not a question of policy, but of necessity.

MR. NABARRO asked the Minister if he would bear in mind that the Gas Council had recently announced its intention to spend £1,000,000 on boring to depths of 6,000 ft. to 7,000 ft. in searching for resources of natural gas. In view of the fact that geological exploration had never been carried to that depth before, would the Minister bear in mind the possibilities of searching for uranium at the same time as the Gas Council was searching for supplies of natural gas.

MR. SANDYS in reply, said he had no doubt that care would be taken to ensure that in the course of any exploratory work that was undertaken a look-out would be kept for any other valuable resources, but, as he had explained, so far as was known, the only area in which there might be worth-while quantities of uranium ore was in Cornwall, in the copper and tin mines.

Iron Ore Imports

Iron-ore imports in September and the total for the nine months of the year to date, with comparative figures for 1952, are shown below.

Country of origin.	Month ended September 30.		Nine months ended September 30.	
	1952.	1953.	1952.	1953.
	Tons.	Tons.	Tons.	Tons.
Sierra Leone	54,313	61,590	579,791	583,736
Canada	75,700	133,755	539,192	859,190
Other Commonwealth countries and the Irish Republic ..	901	19,393	17,923	176,457
Sweden	306,579	393,388	2,734,219	2,857,077
Netherlands	6,198	1,250	31,216	21,227
France	40,244	25,931	316,921	343,280
Spain	46,404	39,840	544,115	347,688
Algeria	150,374	205,042	1,300,304	1,422,052
Tunis	63,100	49,900	432,559	420,640
Spanish ports in North Africa	21,625	—	214,267	—
Brazil	9,700	26,563	73,355	233,231
Other foreign countries	55,215	106,088	541,844	1,065,836
TOTAL	830,353	1,062,740	7,325,706	8,330,414

Bersham Foundry Development

Bersham Foundry, Limited, of Rhostyllen, near Wrexham, a subsidiary of Sidney Flavel & Company, Limited, Eagle Foundry, Leamington Spa, have recently installed equipment capable of machine moulding box sizes up to 16 ft. long by 8 ft. wide, with a 4-ft. 6-in. pattern draw and weighing 15 tons. The firm is engaged upon the manufacture of machine-tool components. For the conduct of this foundry the following appointments have been made. Mr. T. W. Wynn, who is on the local Board, is general manager of the foundry; Mr. J. Chippendale is foundry manager; Mr. A. J. Perrins, works engineer; and Mr. W. J. Lowry is the technical sales director.

More Industry Required in the North

The chronic lack of balance in the nation's industrial structure and the greater vulnerability to unemployment of the northern industrial areas obviously called for a reconsideration of the Government's policy on the distribution of industry. This point was made at a recent meeting of the Lancashire and Merseyside Industrial Development Association, when the need for industrialists to locate their new projects in the north of England and Scotland where there is on the whole a surplus of labour, rather than in the congested parts of the Midlands and south, was strongly emphasized.

Now that licences for factory building are being more freely granted, says Mr. Gerald S. F. Ritson, director of the association, in his annual report, it is more important than ever that strenuous efforts should be made to attract as many new industrial projects as possible away from the Midlands and south. New capital investment must be wisely located if it is to bring the maximum benefit to the national economy, he declares. A parliamentary sub-committee was appointed at the meeting "to maintain close contact with the Ministries and other Government departments and to bring before them the various recommendations made by the association from time to time."

Forty Years Ago

In the issue of the FOUNDRY TRADE JOURNAL for November, 1913, there are at least three cases which go to show that history is being repeated. The first is a paper by F.H.H. (the late Mr. F. H. Hurren?) on "Small Economies in the Foundry," which is to be the subject of a symposium later this month at Ashorne Hill. The paper, however, dealt with aluminium, brass, malleable, and cast iron, whereas the symposium is to be confined to iron castings. The second is the announcement of a national prize competition for the "best" paper by the British Foundrymen's Association somewhat on the lines of the current competition organized by the Institute of British Foundrymen. The third describes something very akin to a popular modern device used in connection with cupola melting practice. The issue carries a number of very good practical articles. Amongst the new companies registered appears the firm of T. H. Watson (of Sheffield), Limited.

American Iron and Steel Institute Medal

Mr. W. C. Bell, of Stewarts and Lloyds, Limited, has been awarded the American Iron and Steel Institute Medal for 1953 for a paper entitled "A Review of European Operating and Technical Practices," which he delivered in New York last May. This medal, which is awarded annually for a paper of special merit and importance to the American iron and steel industry; was established in 1927 and has a two-fold purpose: to perpetuate the memory of Elbert H. Gary, the first president of the Institute, and to stimulate improvements in the American iron and steel industry. There are no restrictions regarding the nationality of the recipient, but this is the first occasion on which the medal has been given to anyone other than a citizen of the United States.

Difficulties in the Production of Centrifugally-cast Nickel-bronze Bearing Shells*

Discussion of the Paper by J. Taylor, Assoc.Met., F.I.M., A.I.Mech.E., Z. Stokowiec, F.I.M., A.M.I.Mech.E., and R. S. Jackson, B.Sc., A.R.S.M.

When the Paper on the difficulties associated with the production of centrifugally-cast nickel-bronze bearings was presented to the Institute of British Foundrymen at their fiftieth annual conference in Blackpool, Mr. E. Longden took the Chair, and the Paper was read by Mr. Stokowiec.

MR. JACKSON showed a series of slides and described how the radiographic technique had been operated. He explained that as regards reproduction of radiographs, by printing one could show either the banding or the porosity: with the latter one applied a high kv. to the X-ray tube and obtained a low contrast on the film, and it would then be within the range of the printing paper, but the consequent low contrast would be insufficient to show the banding. If one wished to show the banding one had to use a rather lower kilo-voltage. In their own work the Author had used 100 kv., which was the minimum available, but possibly a lower voltage would have been preferable, and then one would have obtained high contrast between the various constituents in the alloys. On the other hand, contrast between the sound and the defective metal would be so great that it would not be possible to produce it on a printing paper.

THE CHAIRMAN, opening the discussion, said he knew the three Authors through his association with their firm, and he was very pleased indeed to welcome their general manager and director, Mr. Hancock, who was present at the meeting in active support of a very excellent contribution to the knowledge of cast metals. The Authors thought they had not introduced anything revolutionary, but they had enabled matters to be interpreted in a clearer way, which was in itself a great achievement. The trouble from defective Babbitting was felt also with cast-iron bearings, and he remembered many years previously having to deal with similar problems.

Influence of Pouring Speed

MR. BUTLER (Phosphor-Bronze Company, Limited), said they had, as a company, seen a very similar defect to the porosity in underlying layers of casting, and they had always put it down to too low a pouring speed. He believed that the primary crystals formed, allowing the molten metal to shrink down inside them, the porosity being left in the bore. If the pouring speed were too low, that process might take place after half the casting was poured and the metal which was deposited on top in subsequent pouring would not then sink into the shrinkage cavities already formed, and the shrinkage would be left in the middle of the casting. He had not put it down to gas. If indeed it was gas, might it not be possible that this was picked up from the mould coating? In that connection it would be of interest to know what mould coating was used and whether its volatile content might be responsible.

MR. Z. STOKOWIEC, in reply, said they had used about three dozen different dressings for dies; some of them were refractory materials, some of them had volatile fractions and some had not, but dressing the dies was only a complementary factor and one would get gas from the furnace atmosphere. He would not advise anyone to consider that in the speed of pouring lay the remedy, because they had once thought the same and had progressively increased the speed of spinning, but had not managed to obviate the defects. Such imperfections, in their opinion, were so slight that normally even well-equipped foundries would not be able to trace them. He believed Mr. Butler's company had some similar experience with cupro-nickel alloy and it might be of advantage to members if they could have the benefit of that experience.

Mechanism of Pouring

MR. BUTLER said he had not had as much to do with cupro-nickel as with phosphor-bronze. His firm had encountered that kind of porosity, but he thought Mr. Stokowiec had slightly misunderstood some of his previous remarks; he had not meant the spinning speed of the mould but the actual pouring speed of the metal. Obviously, a centrifugal casting was built up in layers and slow pouring might cause preliminary solidification of the layers already laid down. In other words when half the metal was poured, one might get a shrinkage porosity formed in the bore, and when further molten metal was poured it would not sink into the shrinkage porosity already there. If one could in fact fill the mould completely with molten metal without any solidification taking place it was reasonable to assume that all shrinkage porosity would in fact be in the bore. He also wondered whether in fact the layering was not actually due to each layer of molten metal as it was put down, and in his opinion the faster the pouring speed the less layering should take place.

MR. STOKOWIEC replied that they were trying the experiment of "casting by weight," by which they had an exact amount of metal in the ladle and poured it into a rotating die through a small hole in the front plate. That hole was even smaller than the bore of the bush and the whole of the metal was put in at once; the pouring time was no more than about five sec., and one could observe what happened inside the mould. The speed of rotation could be changed, and dependent upon the kind of metal being used,

* Paper printed in the JOURNAL, August 27, 1953. The Authors are attached to David Brown Foundries Company.

the time from when it was poured up to the moment when the bush was formed might be 20 sec., a minute, or, in some cases, three minutes. In the latter case the die was rotated at, say, 1,000 r.p.m. and one waited three minutes before the bush was formed.

The mechanism of building the bush by centrifugal force was such that the first moment was the most fraught with risk—when the liquid metal was coming into contact with the die. The friction between liquid metal and die was very low, therefore the metal was being lifted by the die surface near to the top, gravity was exhibiting its maximum effect and the metal was dropping entirely or partly down till it formed first a thin layer of semi-solid metal and the process of building the bush was speeded up.

They had found that banding structure was formed practically in all alloys, and in some cases it was a good thing. For instance, a casting could better withstand very high pressure because it had a banded structure, but in other cases—extremely difficult cases—when very fine porosity might be detrimental, and that very fine porosity could not be traced by ordinary micro-examination, it was something which could be put down to slow speed of pouring or slow speed of rotating and/or to the evolution of gas.

MR. R. S. JACKSON also, said that the conditions under which they were now making the bushes, as regards the pouring rate, were exactly the same as before. They had changed the method of cooling and the trouble had disappeared.

Field for Future Work

MR. RUDDLE (British Non-Ferrous Metals Research Association) said that in introducing the Paper Mr. Stokowiec had suggested that the formation of banded structures in centrifugal castings might be usefully studied by research organizations such as his own. He asked if Mr. Stokowiec could enlarge a little on this suggestion, and in particular if he could say how far a banded structure was to be regarded as a defect, as that point did not seem to be entirely clear.

MR. STOKOWIEC, in reply, said that their association with the B.N.F.M.R.A. over a number of years had proved beneficial to them and to other foundries, and he had appealed to such organizations as theirs because the majority of research organizations did not consider the centrifugal casting process as a matter of importance, although it was now being widely used for components in aircraft production, in both steel and non-ferrous metals. From his own experience in that field, lasting over 20 years, he had found that many foundries, big and small, were performing extra machining outside and inside cylinder castings, grinding with expensive tools, wasting time in the machine-shop, and finally producing very thin final products which represented only a very small fraction of the weight of the molten metal introduced in the die. In his view in this country there was a lack of a simple explanation of the principle of the horizontal centrifugal process which could be fully understood by every foundryman and engineer. As far as the vertical process was concerned, the position was not so bad, because this process had been well known for many years and was properly applied in foundries.

Dr. Northcott, in his last lecture, had warned them not to expect to be able to put anything they melted into a rotating die and then get good products. He would go even further and say that it was possible to put a very good metal melt into a die under ideal conditions and to have a very good plant on which the management had spent a lot of money, but the products would not be good if it were not realized that the principle of horizontally-spinning bushes was different from vertical operation. Furthermore, each alloy should be treated differently; if the same technique were applied to each alloy it would result in bad castings, so if the casting section of B.N.F.M.R.A. could get a small centrifugal machine for experiments, more light might be thrown on the subject.

Difficult Alloy to Cast

MR. FRANK HUDSON (Mond Nickel Research and Development Department) said he was particularly interested in the Paper as he was initially partly responsible for David Brown's client adopting that particular alloy, and although it was more difficult to cast than the normal type of bearing bronze it gave surprisingly good results in service. It was obvious from the Paper that the effects of gas played an important part in the production of sound castings. When one had 20 per cent. of nickel in a copper-base alloy, that addition certainly increased the solubility of hydrogen in the alloy which might, or might not, be advantageous. For example, if founders were melting copper under conditions which would promote hydrogen absorption they might get their copper with the maximum amount of hydrogen that it could dissolve, and if they added the nickel at the end of the melting operation this would increase the solubility of hydrogen in the melt and minimize the dangerous effects of excessive gas. In other words, by adding the nickel last, they enabled the alloy to retain a larger percentage of hydrogen in solution which would otherwise be evolved on cooling. On the other hand, if they had to melt pre-alloyed ingots or scrap then the amount of hydrogen which the alloy would pick up during melting was obviously greater than when virgin metals were employed.

In reading the Paper he had thought that the attempts to ensure a gas-free melt had not been very successful. Three methods had been tried, the first being the use of an oxidizing flux which might—or might not—give a gas-free melt. Oxidizing fluxes were very good in many respects but one could not always be sure that they were doing their work unless some kind of a control test was made after each melt. That is to say, it was necessary to ensure that the flux had de-gassed the melt. For

example, if the metal was left in the furnace too long, the flux ceased to be active, and it did not follow that the melt was completely de-gassed. It was necessary to take steps to check it.

The second method outlined was the addition of titanium, but he did not think that would have any effect, so far as degasification was concerned, in view of the small amounts of titanium added. The third method, *i.e.*, the use of nitrogen as a scavenger, would probably give the best and most positive results, but it would be necessary to pass the nitrogen through the metal. Directing the flow of nitrogen on to the surface of the metal would have no effect. If one used oxygen (or air) and injected that on top of the molten metal, it might have the same effect as bubbling nitrogen through the melt. However, he did not think the alloy would be susceptible to any detrimental effects from nitrogen, and therefore one could safely scavenge with nitrogen, by bubbling it through. That would give positive degasification. To get a gas-free melt, his suggestion was that founders should try out the effects of bubbling nitrogen through the melt or alternatively directing a stream of oxygen on to the surface of the molten metal. So far as metal losses were concerned, the use of nitrogen would probably prove the more economical.

Alternative Method of Production

Although he did not claim to be an expert on centrifugal casting, it seemed to him that small castings were not an easy job to produce by normal horizontal centrifugal casting methods, particularly where founders were spinning a bush not more than 5 in. dia. He would like to see these shells made by the spoked-wheel method, where the castings were spun in a radial plane instead of having their centre at the centre of rotation. By making them in that way, founders might conceivably get rid of the banded structure and transfer effects due to dissolved gas into a part of the casting which was not subsequently treated with Babbitt metal.

Finally, he thought that where the founders were getting blowholes after babbitting these were not due to gas evolved from the metal, because most of the gas in the metal would have been evolved on solidification. Such defects were caused by expansion of air within porous cavities. He mentioned this point just to make sure that members in the audience did not mistakenly believe that it was gas in the metal which was evolved, whereas, in fact, it was air.

MR. STOKOWIEC said the specification, which they had finally slightly altered, was not too bad for casting, and one should realize that this type of alloy was one capable of acting as a bearing metal itself, which was most important for that type of job.

Melting and Gas Porosity

With regard to gas porosity, it was true that he and his colleagues had failed as far as nitrogen scavenging was concerned, and he thought they should spend more time on improving this method. They had tried to melt the metal not only in an electric furnace but also in crucibles and to eliminate gas altogether, and when they had cast ingots statically and examined them no gas porosity could be seen, but when they came to make the bushes they found that they were not perfectly sound. Gas as the main trouble-maker had received over-emphasis, and in his introduction he had mentioned that the present Paper was only part of a larger investigation.

They melted all their alloys and examined them in the way described in the Paper, and, as far as banding structure was concerned, only one alloy—straight cupro-nickel—was free from it. All the others—gunmetal, bronze, phosphor-bronze, high-nickel bronze, low-nickel bronze—all showed the banding structure. As far as melting conditions were concerned, they had tried to use virgin metal and re-melted ingots free from gas. The nickel had been added as 50/50 cupro-nickel alloy, and they had attempted to maintain an oxidizing atmosphere throughout, and even when they had tried swarf they had still produced a fairly good casting, even when judged by very strict X-ray examination.

With regard to scavenging, again, they had experienced some trouble with phosphor-bronze. They had tried to apply scavenging to all their castings, and had not gained much; not only for centrifugal horizontal casting but vertical spinning as well as sand casting. This had been applied over a period of several months, but they had been unable to get any sign of improvement.

DR. W. T. PELL-WALPOLE (University of Birmingham), referring to the question of the banded structure and its relationship to alloy composition, purely from the metallurgical point of view, said the fact that they had found it in every alloy they had tested, except the straight cupro-nickel, suggested that it was likely to be the original type of banded structure observed in non-ferrous metals and first described in detail by Northcott. The latter had also advanced a most satisfactory explanation of it, namely that it occurred in alloys of long freezing range, and not only long freezing range from the temperature point of view but those in which there was a wide compositional range between the liquid and the solid. With those conditions, after a certain stage of solidification one could get a liquid immediately adjacent to the advancing solid phase in such a condition that due to the relative slowness of diffusion and evening-up of composition, metal which was further in towards the bore might reach a spontaneous crystallization temperature and produce quite independent equi-axed crystallization. With that condition one would certainly get gas in the enclosed liquid there in preference to anywhere else and, of course, when one had a low-melting-point constituent, the gas certainly would tend to drive the remaining liquid back through any interstices which were left—even occasionally back to the wall, giving the radial streaks of segregation, as well as the circumferential ones.

Difficulties in the Production of Centrifugally-cast Nickel-bronze Bearing Shells—Discussion

Another Explanation

There was just one other possible type of banding structure which occurred fairly commonly in some types of centrifugal casting, such as the very old and well-known one of casting the actual white-metal lining by the centrifugal process. In this process, due to pure gravity effect, there were two constituents, one of which was lighter and one of which was denser that the mother liquid. The denser one moved in the one direction and the lighter one, which in the case cited was actually the antimony/tin compound, moved in the other direction and there resulted a banding segregation from that source. In the copper-base alloys, however, he felt that Northcott's explanation was the most satisfactory one and that it would occur in alloys of long freezing range, and that one was likely to get such supervision as was possible rather by controlling the temperature gradients and rates of solidification than by anything else.

With regard to the suggestion made by Mr. Frank Hudson, his proposed method certainly would cut out the banded structure as it occurred because if there were any banding it would be in the other dimension and not from the outside towards the bore.

MR. JACKSON, in reply, said that the previous speaker's comments about the width of the freezing range might have included that of the aluminium-bronze where, under certain circumstances, one could get a similar degree of segregation with only a few degrees of freezing range, and also the cupro-nickel alloy with a narrow freezing range. Their experience had been that this particular type of banding had been restricted to alloys that would freeze as two phases, whereas the particular cupro-nickel alloy to which they had been referring went solid as a homogeneous solution. Many types of banding had been recorded by Northcott and Deakin, and it should be emphasized that that particular type was only one of many. This was referred to as micro-banding; in other words a change in composition, elemental composition and phase, within individual bands, those bands being repeated from the outside to the inside, whereas in the case of the cupro-nickel there was not that change in phase.

The radiographical method of examination in combination with the micrographical examination was very important. The present Authors had shown in Fig. 8 of the Paper the junction of the band, with the defective metal of substantially different composition from the other. It had not been established that there was a constant rate of cooling, and hence the difference in the phase composition could possibly be due to a change in the cooling rate, but they had effectively eliminated that possibility by the fact that the radiographical method depended on the actual elements themselves and not on the phases in which they occurred.

DR. PELL-WALPOLE commented that he had really been trying to say that because it was possible to get banding from some cause other than found by the Authors, they were really trying to point out the same thing—*viz.* that there were various possible causes and one had to find the particular one responsible in each case before there was any likelihood of getting the cure for it.

MR. JACKSON said that that particular type of banding had been associated by some investigators with vibration but he personally did not feel that it was the whole story, because vibration in itself was a rapidly changing gravitational field. In the horizontal axis process, at the top of the bush one had the centrifugal gravitational field minus 1, but on the bottom one had the gravitational field plus 1, which was in essence the same as vibration, and he believed that particular type of banding was at least associated with rapidly changing gravitational fields.

Vacuum Test for Gas

MR. LOGAN congratulated the authors on the excellence of the radiographic techniques which they had used and said it was a pity that some of the illustrations shown as slides could not have been incorporated in the Paper as they were of very great interest. The correct diagnosis of the cause of the trouble seemed to be turning the discussion into a controversy as to whether it was shrinkage porosity or gas porosity. Two speakers had indicated that in their opinion it might easily be a case of shrinkage porosity, whereas the Authors themselves had decided in favour of gas porosity, as in their conclusion number (3) on page 9 of the preprint, where they indicated the methods they had used to try to eliminate gas. Mr. Hudson had very adequately dealt with the question of gas content and the methods for its elimination, and it was surprising that the Authors did not seem to have pressed that as far as they might have done.

The Authors had mentioned that they had cast static ingots for detecting gas and had been unable to see any gas in them; that was not surprising, because he believed there was a fundamental difference in the behaviour of gas when metal was cast under centrifugal conditions. The mechanical effect of centrifugal casting might well release or precipitate most of the gas, as compared with a static ingot which might not necessarily indicate all the gas present. In that connection he wondered whether the Authors had considered the possibility of the vacuum-solidification test for gas. It had been used in the aluminium-alloy field but he did not know of anyone who had yet successfully used it in the heavy non-ferrous field; it might offer some possibility for revealing gas where an ingot cast statically, might not.

MR. JACKSON, replying first to the last point, said that at the time they had no suitable apparatus available to make the test. It was true that it had been used chiefly for aluminium alloys, but when applied to bronzes it had not, up to the present, given the same measure of success. Whether or not the apparatus would be improved in the future it was impossible to say, but one essential difference

was that the aluminium alloys had an impermeable skin on the top when they froze, whereas the bronzes generally had no skin to retain the metal, so that the gas could diffuse without its being apparent. Various theories had been advanced regarding the segregation of the metallic constituents within statically-cast ingots, but, generally, they involved the gas being precipitated. He believed that the figures which had been produced for static ingots adequately bore out the point that segregation would occur in chill-cast or sand-cast specimens, possibly due to gas. He was unable to be dogmatic, but he thought there was a greater possibility of more gas actually coming out of solution in the case of a static than in a centrifugally-cast bush because in the latter case, there being a much greater gravitational field, the pressure build-up of gas before it was precipitated would be many times greater.

Gas or Shrinkage?

Referring to the question as to whether it was in actual fact gas or shrinkage porosity, in fracturing the bushes the porosity with which they had been troubled was a definite pink colour, whereas the shrinkage porosity on the inside was black, and the two were very easily distinguished. When they were examined by the aid of polarized light under the microscope, considerable difference was observed, in that the porosity on the inside—the shrinkage porosity giving the black fracture—was shown by its red colour to contain cuprous oxide, whereas no such colour was detected in the case of the pink-coloured porosity. They had advanced the theory that the pinkness was simply an interference film on the surface.

MR. STOKOWIEC, also in reply, said they had been interested in Dr. Northcott's contribution to the subject of centrifugally-cast bushes from the beginning and they had hoped that he would be present at the meeting and would offer some comments. It might be a good idea to have a further discussion with interested parties. He and his co-Authors were very pleased to have helpful advice and they did not pretend to know the answers to all the problems. Their research was only part of a long-term investigation, and if others would assist in carrying it further it might be possible to solve the problem entirely.

More Research Needed

MR. TAYLOR emphasized the fact that the Paper had been presented with the idea of encouraging further work on banding. It was true that quite a long story had been given of what might be called an ordinary commercial trouble, and that in itself did not justify the presentation of the Paper. Reference had been made by Mr. Ruddle to the necessity for carrying out investigations on banding, and it really was a serious problem. He had seen quite large cylinders cast centrifugally in which the banding was so severe that the castings simply disintegrated into sections when they were machined.

Mr. Hudson had referred to melting conditions, but it should be remembered that the investigation had been carried out in a number of sections which had been done simultaneously, and they had felt that they would obtain a quicker solution by controlling the method of cooling rather than the somewhat delicate control of the condition of the metal itself. It was obviously not an easy problem; they had taken metal tests, as they normally did, and the metal appeared to be quite good. There was no sign of gas in the ordinary tests in the very early stages, so whilst it was true that they might have solved their particular problem by very careful control of gas during melting, they considered they had chosen the best solution, and what was more, it was applicable to other metals besides the particular alloy discussed.

THE CHAIRMAN said that in some work in Scotland it had been found that the metal was not completely deoxidized, and it was necessary to submit metal to a third treatment, which again attempted to get rid of gas remaining after the standard degassing treatment.

MR. R. A. MILLER (Foundry Services, Limited) said the chairman was probably referring to a paper by Mr. Hinchcliffe in which he had mentioned the use of lithium as a combined de-gasser in relation to Monel metal, nickel-bronzes and one or two other types of alloys, and actually it would be interesting question to find whether serious consideration had been given to the use of lithium instead of titanium. In view of the affinity of lithium and hydrogen, it was likely to be far more effective than titanium, although there might be some other purpose in mind.

THE CHAIRMAN replied that it was quite a different treatment to that which the metal was normally subjected, that was to prevent hydrogen absorption by oxidizing, then finally deoxidizing, because it had been proved that the metals still retained oxide which had not been removed by the previous treatment.

In proposing a vote of thanks to the three Authors and to their company for bringing forward the very controversial questions, the Chairman expressed the hope that it would be the beginning of a great deal more investigation in the field of non-ferrous metallurgy.

Settled Prices Promote Orders

The chairman of the Wolverhampton Die Casting Company, Limited, Mr. R. Whitehead, reports in his statement with the full accounts to June 30 last that the settling of zinc prices at reasonable levels has created an influx of orders for zinc alloy die castings. The company's plant is now working at full capacity, the order-book is well filled for several months ahead, and there seems no doubt that at existing price levels for zinc the demand can be developed to a considerable extent, he declares.

Referring to the results of the year under review, the chairman states that the group trading profit of £166,337, against £198,449, may be considered satisfactory in view of the fact that the 35 per cent. fall in price of zinc during the period, together with the reopening of the zinc market on the London Metal Exchange, caused considerable fluctuation in demand for zinc alloy castings. He points out that several months' notice was given of the intention to free zinc marketing, and the board was able to minimize the effect of the anticipated fall in price.

Book Reviews

F.B.I. Register of British Manufacturers. Published by Iliffe and Sons Limited, Dorset House, Stamford Street, London, S.E.1. Price 42s. (post free).

This attractive directory this year carries a foreword by Sir Harry Pilkington, the president of the Federation of British Industries. No noteworthy change is apparent from that of last year, which means that it still retains the introductory information and instructions as to how to use the book in both French and Spanish, and such useful features as trade names and trade marks. The main sections of course are the buyers' guide and the alphabetic section of addresses. Many of the advertisements are very tastefully displayed.

Industrial Brazing by H. R. Brooker and E. V. Beatson. Published by Iliffe and Sons, Limited, Dorset House, Stamford Street, London, S.E.1. Price 35s. (Postage 1s. 1d.)

This is, so far as the reviewer knows, the first full-length book to be printed covering the subject of brazing. The choice of authors has been wise as one is connected with the manufacture of brazing materials and the other is attached to a firm which is a large user of the process. The book, running as it does to 344 pages, carrying 203 diagrams is comprehensive. Although not much brazing is done in the foundry industry and in many cases it is limited to the repair of band-saws in the pattern shop, a text book on this subject is obviously a welcome addition to any metallurgical technical library.

Stahl und Temperguss (Steel and Malleable Castings) (3rd Edition), by E. Kothny and **Einwandfreier Formguss** (Sound Castings) (3rd Edition), by E. Kothny. Both books published by Springer-Verlag, 20 Reichpietschufer, Berlin W 35, price 3.60 DM each.

These two books are members of a series of handbooks intended to be used by engineers and works technicians. There are altogether over one hundred of these handbooks covering a wide range of engineering technology. The books are short (the first one has 70 pages of text and the second one 64 pages) and they are clearly not intended for the specialist, although they might be of considerable use to a student.

The first book deals with steel and malleable castings and is clearly written to assist the user of these materials. Books that fulfil this function serve an extremely useful purpose. How many engineers appreciate the advantages and the limitations of castings? How many engineers really understand the nature of malleable cast iron? This handbook would assist the engineer in obtaining some comprehension of this material, its uses and its production.

The second of these handbooks deals with essential features for the production of sound castings. Again, it is doubtful whether the foundryman would obtain much direct benefit but the book does give the engineer an insight into the need for modification of design to suit the casting process.

The future of the founding industry depends to a large extent on its ability to obtain the confidence of the engineer and designer. The type of information given in these handbooks is ideal for this purpose.

H.M.

THE "IDEAL HOME EXHIBITION" is to revert to its pre-war hours—10 a.m. to 10 p.m.—at Olympia next March.

"Dismissed from our Employ"

Are the words "We have dismissed (person or persons by name) from our employ" contained in a letter circulated by employers capable of bearing a defamatory meaning? This was a question which was before the Lord Chief Justice in the Queen's Bench Division recently, when his lordship gave judgment on a preliminary point of law set down on application by defendant employers as a special case in an action for libel. In the opinion of his lordship the words were capable of a defamatory meaning in a letter of this sort.

His lordship said that in his opinion the present case was not the class of case that it was ever contemplated should be set down as a special case under Order 25, Rule 2, of the Rules of the Supreme Court The order was in lieu of demurrer and a case should not be set down under it unless the decision, whichever way it was decided, disposed of the action. He had never in the course of his experience heard a special case of this sort in a libel action. He had been asked to say, as a matter of law, that the words complained of were incapable of bearing a defamatory meaning. The case should not have been set down as a special paper, but, as he had been asked, he would say that he thought the persons receiving the letters complained of would think that the plaintiffs had been dismissed for misconduct. Very often public servants were given the option of resigning or being dismissed, and that meant that if they did not resign they would be dismissed for some misconduct.

In his opinion the words "Dismissed from our employ" in a letter of this sort were capable of a defamatory meaning; whether they were defamatory or not was not for him to decide, but for a jury.

Lifting Accident Sequel

In the Court of Session at Edinburgh on October 29, before Lord Strachan and a jury, an action was raised by Mr. Robert McLean, moulder, against Lion Foundry Company, Limited, for the sum of £2,000 damages for alleged injury to his back on December 3, 1951 in the course of his employment with the company. Evidence was led for the pursuer that when lifting the drag of a moulding box with his mate, Mr. Alexander Machray, Machray suddenly let go his end of the drag leaving the pursuer the full weight of the drag, and as a result he sustained an injury to his back.

The defender's case was that Machray never lifted the box, and that just before the alleged accident and in preparation for lifting, he bent down to turn up the two hooks at his end of the box. This was supported by Machray and evidence from the defenders' ambulance records was produced to show that the pursuer (McLean) had reported after the alleged accident that he had hurt his back when lifting a box. No mention had been made at that time that the box had been dropped by his mate. At the conclusion of the evidence the jury gave a verdict in favour of the Company.

Latest Foundry Statistics

According to the British Bureau of Non-ferrous Statistics, the output of copper-base castings during September was 4,409 tons. During the first three quarters of the year 35,565 tons were produced, as against 50,990 during 1952.

Personal

MR. JAMES S. SMITH, of Union Grove, Aberdeen, has been appointed engineer-manager with Brooke Marine, Limited, shipbuilders and engineers, Lowestoft.

MR. J. W. LYTH, who has retired after 59 years' service with the Goldendale Iron Company, Limited, Tunstall, Stoke-on-Trent, has been presented with an inscribed wristlet watch by the workpeople.

MR. R. GORE has been appointed methods engineer to Sheepbridge Engineering Company. His previous experience has been with Rolls-Royce and Vauxhall Motors.

MR. E. COOPER, a director and general manager of A. C. Morrison (Engineers), Limited, Loughborough, is visiting the Middle East and Indian sub-continent to investigate market conditions and requirements.

MR. R. H. WEIR, at present director of Engine Research and Development at the Ministry of Supply, will become principal director of the department with effect from January 1, in succession to Air Commodore F. R. Banks.

The appointment of MR. A. ROBERTSON, of Alley & MacLellan, Limited, engineers and ironfounders, etc., of Glasgow, to the position of general manager, applies to the company's valve works at Worcester and not to the firm as a whole as was implied in our last issue.

DR. T. SCOTT GLOVER, who is managing director of R. Y. Pickering & Company, Limited, rolling-stock manufacturers, of Wishaw, has been appointed chairman of the newly formed Motherwell Productivity Committee of which MR. J. W. STANLEY, assistant secretary of the Lanarkshire Steel Company, Limited, has been elected secretary.

COL. F. A. NEILL, chairman and managing director of James Neill & Company (Sheffield), Limited, steel manufacturers, has been elected chairman of the East and West Ridings Region, Federation of British Industries. A past Master Cutler, Col. Neill is president of the British Hacksaw Makers' Association and of the Sheffield branch of the Incorporated Sales Managers' Association.

MR. A. C. WINTER, secretary of C. R. Denton Steel & Tool Company, Limited, Sheffield, for the past five years, has been appointed a director of the company. Mr. Winter, who is also secretary of Tipped & Welded Tools, Limited, and cashier of the Crucible Steel Company, is a member of the council of Sheffield Junior Chamber of Commerce, and Press and publicity officer to the chamber.

MR. H. FIELD has retired from his position on the Board of John Harper & Company, Limited, but remains on the directorate of John Harper (Meehanite), Limited, and will continue to act in a consultative capacity. Moreover, he will still represent these companies with the British Cast Iron Research Association, where for the last 25 years he has been a member of Council. His many friends in the foundry industry will wish him many years of well-earned retirement in his new home at Weston-super-Mare.

MR. H. MCNEIL, a director and general manager of Babcock & Wilcox, makers of boilers and ancillary equipment, has now been appointed deputy managing director. Mr. J. S. Robertson, formerly assistant general manager, has succeeded Mr. McNeil as appointed general manager. Mr. McNeil became general manager of Babcock & Wilcox at the beginning of 1947 and a director in 1950. Mr. Robertson, after service abroad with the company, was appointed manager of the Commonwealth sales department in 1951 and subsequently became assistant general manager.

Obituary

W. D. MUIRHEAD

The death is announced of Mr. Walter David Muirhead at the age of 75. He was extremely well known in foundry circles as a pioneer in the quantity production of baths by impeller ramming. He was born in Falkirk and received his early training at the local High School, serving his apprenticeship as a draughtsman at the Falkirk Iron Company, Limited, and rising to the position of head of the drawing office. In 1922, his company acquired an interest in the Greenacre Foundry at Durban, and Mr. Muirhead was seconded to this new plant in 1922, in order to ensure a good start. After three years in South Africa, his task being successfully accomplished, he returned to this country. He resumed his interest in bath manufacture, which had been created in 1920 when he spent a year or so at the Fonderies et Emailleries de Noyon. Thus, in 1929, Mr. Muirhead was transferred to British Bath Company, Limited, Greenford, as general manager, later to become a director. At that time the weekly output was of the order of 500 baths, but when he retired in 1948, it had grown to about 3,000. Mr. Muirhead was an artist of no mean order, and sketching and motoring were his relaxations from an exacting business life.

MR. WILLIAM M. PATTERSON, a director of Charles W. Taylor & Son, Limited, ironfounders, of South Shields, died recently at the age of 56.

MR. HARRY BROOK, of Huddersfield, died on November 10, at the age of 69. Prior to his retirement four years ago, Mr. Brook was chairman of T. Brook & Sons, Limited, engineers, Foley Hall, Huddersfield.

THE DEATH occurred on November 8 of Mr. Constable of Wolverhampton. Son of the late Mr. Charles Constable, of Willenhall, he was managing director of James Horton, Limited, ironfounders, of Willenhall.

MR. ANDREW MCARTHUR MORISON, of McArthur Morison & Company, consulting engineers and ship surveyors, of Glasgow, died recently at the age of 68. He was a founder member of the Society of Consulting Marine Engineers and Ship Surveyors.

MR. GEORGE HODKINSON, who died suddenly on November 10, had been manager of K. factory, Rolls-Royce, Limited, Hillington, since early in 1952. This factory produced all the compressor blades used in the Scottish group of Rolls-Royce factories, and, as manager, Mr. Hodkinson was noted for his organizing ability.

THE DEATH on Monday of MR. JOSEPH JARVIE ST. CLAIR, director of Federated Foundries, Limited, Glasgow, is announced. He was also director and manager of their Falkirk subsidiaries, Burnbank Foundry Company, Limited, Camelon Iron Company, Limited, Grangemouth Iron Company, Limited, and Watson Gow & Company, Limited.

THE DEATH is announced of Mr. W. Hay Mackenzie, M.B.E., T.D., B.SC., joint managing director of Mackenzie & Moncur, Limited, iron and brass founders, of Edinburgh. His death occurred whilst playing golf on November 7. He was 52 and was the immediate past captain of the Morton Hall Club. During the last war he served as Lieut.-Col. in the Royal Engineers. He was educated at Merchiston Castle School and Edinburgh University, and was one of the Holyrood High Constables.

News in Brief

HEPBURN CONVEYOR COMPANY, LIMITED, foundry engineers, Wakefield, announce that they will shortly put on the market a shell-mould-making machine.

SMITH'S ELECTRIC VEHICLES, LIMITED, Team Valley, Gateshead-on-Tyne, 11, have changed their title to Smith's Delivery Vehicles, Limited.

BRITISH TIMKEN, LIMITED, with existing factories at Aston, Birmingham, and Duston, Northampton, are to build another factory at Daventry to make medium-size roller bearings.

DAVIDSON & COMPANY, LIMITED, Sirocco Engineering Works, Belfast, Northern Ireland, announce that as from November 23 the address of their Newcastle office will be 12, Grey Street, Newcastle-upon-Tyne, 1.

UNOFFICIAL STRIKERS returned to work four days before the expiry of an ultimatum offering dismissal from their firm, Jas. Beresford & Son, Limited, hydraulic and general engineers, etc., of Marston Green, Birmingham.

PRICES of antimony in the United Kingdom were reduced by up to £15 a ton as from November 9. English antimony, 99.6 per cent., now costs £222 10s. (previously £237 10s.), 99 per cent. £210 (£225), and crude 70 per cent., £200 (£210).

BORAX CONSOLIDATED, LIMITED, Regis House, King William Street, London, E.C.4, announce that as from December 1 the U.K. schedule prices will be reduced for all products by £1 per ton. This reduction applies immediately.

AT THE NEXT MEETING of the Midland section of the Institute of Vitreous Enamellers, on November 26, Mr. J. Semple will present his "Whittle Silver Medal" paper on "One-coat White Enamels" in place of the item previously listed in the programme.

MEMBERS AND GUESTS numbering some 170 attended the sixth annual dinner/dance on November 10 of the Staffordshire Iron and Steel Institute, in the Civic Hall, Wolverhampton. The president of the Institute, Mr. A. W. Shore, and Mrs. Shore received the guests and Mr. Shore was chairman at the dinner.

AS A RESULT of complaints from local residents that they cannot grow plants in their gardens owing to pollution from the factory of Bradley & Foster, Limited, ironfounders, etc., of Coseley, an experimental garden is to be laid in the factory grounds to test whether dust and fumes from the works affects flowers and vegetables.

AN INJUNCTION restraining John Summers & Sons, Limited, Hawarden Bridge Steel Works, Shotton (Flintshire), from discharging cyanide-impregnated effluent into the Dee estuary was granted by Mr. Justice Roxburgh in the Chancery Division on November 5. He said there would be an inquiry about damages. The hearing lasted 11 days.

TYPICAL seasonal changes caused the number of unemployed on September 14 to rise by 17,100 to 309,100 by October 12. However, persons employed in the manufacturing industries rose by 53,000, of which 15,000 went into the engineering, metal goods, and precision instruments section, 2,000 into metal manufacture, and a further 8,000 into the manufacture of vehicles.

IN THE FIRST EIGHT MONTHS of this year Norway's iron-ore, pig-iron, and crude steel production has risen compared with the corresponding period of last year. Production of iron ore and ferro-titanium ore was 813,773 tons, compared with 464,773 tons in 1952; pig-iron output was 36,503 tons, compared with 36,483 tons, while crude steel production was 70,698 tons, against 63,399 tons.

MR. E. COUPLAND, chief engineer Rubery Owen, Limited, Darlaston, presided over the first of a series of instructional lectures on fuel efficiency in industry, pioneered by Wolverhampton's Fuel Efficiency panel. Between 40 and 50 representatives of works in the area heard a talk by Mr. A. H. Pinder, Regional Fuel Engineer of the Ministry of Fuel and Power, on boiler-house practice.

AN INFORMAL DISCUSSION on the training of metallurgists for industry, organized jointly by the Institute of Metals and the Institution of Metallurgists, will be held at the Royal Institution, Albemarle Street, London, W.1, on November 27, from 10.30 a.m. to 12.45 p.m., and 2.15 p.m. to 4.30 p.m. The chair will be taken by Professor F. C. Thompson, president of the Institute of Metals.

MIDLAND MANUFACTURERS have found that it is small goods, those to which mass-production methods cannot be applied, that provide best exports to America, states the current issue of the Birmingham Chamber of Commerce *Journal*, commenting on the "distinctive demands" of the American market. "It is true, however, that in the United States there is a certain rigidity of style in some products that gives an opening to our own people," states the *Journal*.

A REDUCTION in the capital of Tees Foundries, Limited, Darlington, from £250,000 to £175,000 by returning £1 upon each of 75,000 ordinary shares, was confirmed by Mr. Justice Roxburgh in the Chancery Division recently. Counsel told his lordship that the company held £160,000 in cash and all the shares were held by a parent company, Pease & Partners, Limited, or its nominees. All the shareholders had consented to the proposed reduction.

SEVEN EMPLOYEES at Northern Aluminium Company's Works, Middlemore Road, Handsworth, were presented on November 12 with aluminium watches in recognition of their 25 years' service to the company. The presentations were made by the managing director, Mr. Fraser W. Bruce, and the recipients were Mr. Wilfred Adams, Mr. Richard Davies, Mr. R. James Hall, Mr. Sydney Law, Mr. John Olbrechts, Mr. Edward Parkes, and Mr. Leslie A. Stokes.

LT.-COL. R. K. MORCOM, chairman of Belliss & Morcom, Limited, presented gold watches to seven women employees having 30 years or more service, at a meeting in the Board room at the Ledsam Street, Birmingham, works on November 11. The years worked totalled 270. The presentation was an extension of the arrangement under which gold watches were presented last year to men of 50 years' service, as part of the firm's centenary celebrations.

THE WAKEFIELD Society of Model and Experimental Engineers, which is now in its second year, has just concluded its first and a very successful exhibition in Service House, Wakefield. The Society covers all branches of model engineering, operates a multi-gauge portable railway track, built by its own members, and has arranged numerous visits for its members to factories and works. At present an important objective is to secure a clubroom and central workshop for members.

THROUGH THE GOOD OFFICES of the Mayor of Warwick, the Australian town of Warwick has been able

(*Continued on page* 640)

THEY CHANGED TO FUEL OIL

CONVERSION TO FUEL OIL SOLVED MANY PROBLEMS

In a large residential block of flats, solid-fuel fired boilers were used for space and water heating. A staff of three firemen was required in shifts covering a 24 hour period. Nevertheless, complaints from residents regarding shortages of hot water at peak periods were frequent. Conversion to fuel oil provided the following advantages :

Firing was fully automatic with fuel oil — labour costs almost eliminated • Flexibility of oil firing enabled ample supplies of hot water to be available to meet all peak load demands and to effect economical operation in low load periods • Unsightly, dirty and limited storage facilities were eliminated • Previous problem of ash removal was overcome • No waiting for supplies • Fuel oil deliveries made at short notice.

Here is another case where conversion to Esso Fuel Oil has resulted in a reduction of labour costs, greatly increased efficiency and ease of operation. *Your* installation may be particularly suited for conversion to fuel oil firing. May we arrange for our Technical Representative to call and discuss the matter with you?

It pays to say ESSO **FUEL OILS**

ESSO PETROLEUM COMPANY, LIMITED, 36 QUEEN ANNE'S GATE, LONDON, S.W.1

News in Brief

(*Continued from page* 638)

to secure sufficient steel to complete the building of an important bridge. Only 30 per cent. of the steel required was available in Australia. This interesting fact was revealed by Mr. Tom J. Cooke when recounting to Leamington Rotary Club on November 10 his experiences on a recent visit to Australia where, he said, there was an amazing volume of goodwill for the home country.

MR. B. G. L. JACKMAN, president of the Birmingham section of the Institution of Production Engineers, speaking in Birmingham on November 10 on the human aspect in production and planning control, said that it was incumbent on labour to accept the inevitable fact that industry could only progress by mechanization. Mr. Jackman said that at his firm output was from 10 to 17 per cent. higher on the night shift than on either of the two day shifts because there was less interruption and more concentration.

AN ANCIENT FIRE ENGINE which has been long in use at the Blackheath works of the British Thomson-Houston Company has been presented to the Birmingham Museum of Science and Industry. A 1911 petrol-driven engine, it is to stand with three old hand-operated engines. The fire engine made its last journey under its own power for the seven-mile trip from Blackheath to Birmingham, but Ministry of Transport permission had to be obtained, since solid-tyred vehicles are no longer normally allowed to travel the roads.

COL. C. A. B. LINDOP, chairman of the London Aluminium Company, Limited, and a director of the South Western Industrial Corporation, Limited, left for New York recently. He will be accompanied by Mr. F. P. Webster, managing director of London Aluminium, who is also a managing director of the South Western Industrial Corporation. Their visit is in connection with a new joint venture by the South Western Industrial Corporation, through its subsidiary, Midland Metal Spinning, Limited, and London Aluminium.

THE POSSIBILITY of casting tools is being explored at the new Guest Keen & Nettlefold research laboratory opened six months ago at Lanesfield, near Wolverhampton. The possibility of "hobbing"—forcing a die into a block of steel—is also being experimented with, as an alternative to cutting the tool. The laboratory is investigating spark-cutting techniques with regard to tool production. The laboratory operates under the director, Dr. T. Emmerson, and projects are designated in consultation with the G.K.N. Group Research Committee.

GUY MOTORS, LIMITED, Wolverhampton, are about to ship an armoured mobile bank to the Bank of Patiala in India. The chassis is a Guy "Otter" six-tonner, 9 ft. 9 in. wheelbase, with forward control, and has a Gardner 4LK engine and Eaton two-speed rear axle. The body and cab were built by Normands, Limited, London, the cab being steel framed with side panels in 7-mm. armourplate. The roof and dash are in 3-mm. armourplate and the body is panelled externally in 7-mm. armourplate with welded joints on a frame of rolled-steel sections.

"LUBRICANTS for Metal Working Operations in the Non-ferrous Metals Industry" will be the subject of a discussion arranged by the metallurgical engineering committee of the Institute of Metals, to be held at the University, Edgbaston, Birmingham, on January 6, 1954, from 10.30 a.m. to 4.30 p.m. Mr. W. J. Thomas, M.I.MECH.E., will preside. Members and visitors who desire to do so may obtain luncheon (4s. 6d., including coffee) in the University Refectory, provided that they notify the secretary of the Institute (at 4, Grosvenor Gardens, London, S.W.1) to that effect.

NOT WIDELY KNOWN is the fact that the larger public libraries offer a much wider range of services beyond the mere storing and loaning of books. For instance, some of the extra facilities provided by the Borough of Islington Public Libraries have been described in an 8-page leaflet detailing their commercial and industrial information service. Among the items available are:—Board of Trade market information; over 1,900 British Standards; specialist book collections on seven branches of science; hundreds of trade periodicals; an enquiry bureau; microfilms of *The Times*, and a number of annuals and directories.

AUGUST was a record month for Austrian pig-iron and crude steel production. Pig-iron production rose from 114,929 metric tons in July to 121,652 metric tons in August, compared with 96,757 tons in August, 1952. Crude steel production, at 111,644 metric tons, was 4,000 tons higher than in July and 29,000 tons higher than August of last year. Output of rolled products was 64,211 metric tons, which was slightly lower than in July, but 7,000 tons greater than August, 1952. Other production figures were:—Sections, 2,270 (2,219) tons; strip, 3,259 (5,173) tons; wire rods, 9,938 (7,618) tons; merchant bars, 17,842 (15,177) tons.

DANIEL SMITH, LIMITED, Castle Ironworks, Wolverhampton, pioneers in the manufacture of machinery for cold rolling and forming of metal sections, have produced a new machine-tool for the needs of the domestic lawn-mower industry. The machine produces rotary blades from a roll of flat strip high-carbon steel and, in addition to forming the profile of the blade, the machine applies the right camber and helical twist required to suit the rotating frame to which the blade is fitted. Totally enclosed and with a self-contained drive, the machine will take metal from coil or in cut lengths, at an approximate rate of 30 ft. per min.

AN INTERESTING DEVELOPMENT in the Birmingham area is the formation of "pilot groups" by some trade associations the aim of which is to investigate ways and means of rationalizing production. In the non-ferrous metal trade, for instance, it has been suggested that if each firm could concentrate on one particular line, it would reduce production costs, and such specialization would compensate for the loss of business caused by dropping other lines. Conduit fittings have been quoted as a case in point where rationalization is desirable. Almost every firm in the business makes every size of elbow and T-joint, in a variety that prevents long, economical production runs and obviates simplification of such matters as tool making.

THE VISIT to Chicago of the chairman and joint managing director of Brook Motors, Limited, Huddersfield, Mr. Frank V. Brook, and the export manager, Mr. G. M. Shepley, early this month completed the inauguration of the new American company, the Brook Motor Corporation. A stock of motors of various types all designed specially for the U.S. market will be held in America to an initial value of £150,000, and the first shipment will leave this country in November. It is expected that an annual turnover amounting to over $1,000,000 will be built up within the first two years of operation. Stocking and servicing agencies are being established. To Brook Motors' nine factories in Huddersfield has been added a new factory recently completed at Barnsley, which is capable of employing a further 1,000 workers to increase output to meet the American demand.